Beach Use and Environmental Quality in Ontario

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for

Policy and Planning Branch
Ontario Ministry of the Environment

May 1987

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ABSTRACT

The Ontario Ministry of the Environment commissioned a study to "develop a computational procedure which could be used to forecast the consequences of pollution abatement and environmental protection programs in terms of changes in beach use and enjoyment." Three prime focuses were identified: the identification and classification of beach sites in Ontario, the identification and modelling of relationships between beach use and environmental, economic, and social parameters, and the economic valuation of beach use.

.   Ontario residents swim about 20 times a year each, for a total of about 180 million swimming occasions per year. They swim about 5.2 times per year each (about 47 million occasions total) at beaches both inside and outside Ontario, or about 4.5 times per year (41 million occasions total) at beaches inside Ontario alone.

.   The value to Ontario residents of beach swimming in Ontario is probably in the order of $20 per occasion, or about $90 per person per year, or about $800 million per year in total.

·RÉSUMÉ

Le ministère de l'Environnement de l'Ontario a fait faire une
étude dont l'objet était d'élaborer un processus informatique
permettant de prévoir les répercussions des programmes de dépollution
et de protection de l'environnement sur l'utilisation des plages et
sur le bien-etre des usagers. Trois éléments principaux ont été pris
en considération : l'identification et la classification des plages de
l'Ontario; la détermination des liens entre l'utilisation des plages et
les paramètres environnementaux, économiques et sociaux, et
l'établissement d'un modèle à ce sujet; et la valeur économique de
l'utilisation des plages.

.   Les Ontariens vont se baigner environ 20 fois par année, soit au
      total quelque 180 millions de fois par année. Ils pratiquent la
      baignade environ 5,2 fois annuellement (environ 47 millions de fois
      par année au total) sur les plages situées en Ontario et à
      l'extérieur, dont environ 4,5 fois par année (41 millions de fois
      par année au total) sur les plages ontariennes.

.   La baignade sur les plages ontariennes représente pour les Ontariens
      une valeur qui est probablement de l'ordre de 20 $ chaque fois, soit
      environ 90 $ par personne annuellement, c'est-à-dire 800 millions de
      dollars par année au total.

SUMMARY

In January 1986, the Ministry of the Environment's Policy and Planning Branch retained Anthony Usher Planning Consultant, in association with Jack B. Ellis and Associates Limited and Michael Michalski Associates, to investigate beach use in Ontario and its relationship to environmental quality parameters. The goal for the study was to "develop a computational procedure which can be used to forecast the consequences of pollution abatement and environmental protection programs in terms of changes in beach use and enjoyment." Three prime focuses were identified: the identification and classification of beach sites in Ontario, the identification and modelling of relationships between beach use and environmental, economic, and social parameters, and the economic valuation of beach use.

Section 1 of this report provides an introduction. Section 2 includes a brief synopsis of the background to the study, a discussion of the fundamentals of beach use and its relationship to environmental quality, and an overview of beach recreation in Ontario. Section 3 provides the results of our work on threshold criteria for beach significance, and a computerized list of and data base for significant beach sites in Ontario. Section 4 provides the results of our work on a computerized, interactive model of beach use in Ontario. This model draws from the data base in the beach list, and permits estimation of beach use for origin and destination regions of the province and individual beach list sites, by simulating the behaviour of the environmental, social, and economic system which generates beach use. Section 5 deals with various aspects of development and use of the beach list and beach use model, including data collection needs and approaches, further development and validation, economic valuation of beach use, and use of the model and data base as decision making tools.

Key findings of the study include the following.

.   The beach list includes 584 significant beaches at 528 separate sites in Southern Ontario. The total length of these beaches is 257 km. Over three quarters of this length is on the Great Lakes-St. Lawrence system, with half on Lake Huron alone. The Government of Ontario and

municipalities are responsible for the administration of 67% of this beach length, and commercial enterprises for another 22%.

. In each of 1984, 1985, and 1986, 4% to 5% of total beach length was posted once or more. The effect of these postings is probably more to redistribute affected use to substitutable, second choice beaches, than to eliminate it.

. Ontario residents swim about 20 times a year each, for a total of about 180 million swimming occasions per year. They swim about 5.2 times per year each (about 47 million occasions total) at beaches both inside and outside Ontario, or about 4.5 times per year (41 million occasions total) at beaches inside Ontario alone. We have identified beach swimming as a practical proxy activity for the total complex of beach use activities.

. The most important destinations for beach swimming in Southern Ontario are Southwestern Ontario, the Golden Horseshoe excluding Metropolitan Toronto, Simcoe County, and the Eastern Lake Ontario-Kawarthas area.

. No significant change in per person participation in beach swimming in Ontario is expected in the near future.

. The value to Ontario residents of beach swimming in Ontario is probably in the order of $20 per occasion, or about $90 per person per year, or about $800 million per year in total.

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INTRODUCTION

downstream beaches on the other, is complex and far from fully understood. The specification of that relationship has been left to others. Our task was to explore the relationship between water quality and other aspects of environmental quality at downstream beach sites, and the various dimensions of recreational use at those sites.

The current microbiological standards for recreational water quality in Ontario (Ontario Ministry of Health 1975/ref. 9.8) are controversial. There has been considerable discussion of the merits of the present versus alternative standards (Ontario Ministry of the Environment 1984/ref. 9.6; Canada Department of National Health and Welfare 1983/ref. 9.2), and questioning of the scientific basis behind various standards (see the two preceding references plus Appendix 2). Ministry staff have even attempted to estimate the economic impacts of the present versus alternative standards (Ontario Ministry of the Environment 1985/ref. 5.64). While the standards used to post beaches are obviously very relevant to any study of beach use and water quality, it was not our assignment to evaluate or recommend alternative standards.

This report is organized as follows.
- Section 2 includes a brief synopsis of the background to the study, a discussion of the fundamentals of beach use and its relationship to environmental quality, and an overview of beach recreation in Ontario.
- Section 3 provides the results of our work on a beach list.
- Section 4 provides the results of our work on a beach use model.
- Section 5 deals with various aspects of development and use of the beach list and beach use model, including data collection needs and approaches, further development and validation, economic valuation of beach use, and use of the model and data base as decision making tools.
- Appendix 1 consists of an annotated bibliography of relevant literature.
- Appendix 2 consists of notes on a workshop held on April 17, 1986 to assist in the development of the study's theoretical framework.
- Appendix 3 includes the beach list proper.
- Appendix 4 includes a list of beaches that failed to meet the criteria

In January 1986, the Ontario Ministry of the Environment's Policy and
Planning Branch retained Anthony Usher Planning Consultant, in association
with Jack B. Ellis and Associates Limited and Michael Michalski Associates,
to investigate beach use in Ontario and its relationship to environmental
quality parameters. The study was undertaken as part of the Beach Management
Program launched by the Ministry after widespread beach closures due to high
fecal coliform counts in 1983 and 1984.

The goal for the study stated in the Terms of Reference was to "develop a
computational procedure which can be used to forecast the consequences of
pollution abatement and environmental protection programs in terms of changes
in beach use and enjoyment." Three prime focuses were identified to achieve
this goal.

.   ". . . the identification and collection of existing data on beach visits
    and on beach-related recreational activities in Ontario. . . . An
    important aspect of this effort is to identify 'beach sites' within the
    province and classify each site according to criteria that will be
    developed in the course of the work."

.   ". . . to examine the relationships between specific beach uses and
    selected environmental quality and other parameters, the perception and
    appraisal of which influence beach use activities, based on theory,
    experience and previous research. . . . Factors that are perceived by
    people may or may not be represented in the water quality or other
    biophysical measurements that can be made at beaches. Thus, it is not
    clear whether the remedial measures or water quality improvement programs
    contemplated by the [Ministry of the Environment] will affect the
    desirability of a beach or, ultimately, the demand for its use."

.   ". . . a review of empirical studies of the valuation of beaches and
    relevant recreational activities is to be undertaken in order to generate
    some representative values to apply in policy analyses and to compare
    with the results of future empirical studies in Ontario."

It was agreed at the outset that our task would be economic and social rather
than biological. Obviously it was hoped that our study would be able to
contribute to better decision making about water pollution abatement and
water quality protection program priorities. However, the relationship
between abatement at source and other upstream environmental protection
initiatives on the one hand, and water quality and its indicators at

for the beach list but are of particular interest because they are located in major urban centres.

- Appendix 5 includes the beach use model proper.

- Appendix 6 consists of a users manual intended to permit Ministry of the Environment staff to explore, test, update, and amend the beach list and beach use model data files, which have been provided to the Ministry on disc.

The standard list of references following Section 5 includes only those sources not included in Appendix 1. A reference in conventional form is to a source listed in the references section. A reference with the words "ref. x.x" at the end is to source x.x in Appendix 1.

The consultant team retained three external reviewers who made essential contributions to the development of the study methodology through participation in the April 17, 1986 workshop, and general advice and assistance. These external reviewers were Reid Kreutzwiser, Department of Geography, University of Guelph; M.D. Palmer, Manager, Water Resources Division, Gore & Storrie Limited; and Geoffrey Wall, Department of Geography, University of Waterloo.

Beach Use and Environmental Quality in Ontario was prepared by Anthony Usher, Principal, Anthony Usher Planning Consultant, who provided overall coordination and direction, and Jack Ellis, President, Jack B. Ellis and Associates Limited, with assistance from Michael Michalski, President, Michael Michalski Associates.

BEACH RECREATION

2.1   BEACH USE AND WATER QUALITY: THE PROBLEM

Ontarians have largely forgotten about the beach use and water quality
problems of the past. In the first half of the 20th century and indeed in
some respects into the 1960s, water contact recreation must have often seemed
a rather hazardous and uncertain business. Sewage treatment was frequently
incomplete or absent. Epidemic disease was often present and at the same
time ill understood; polio scares affected beach use in the province well
into the 1950s. Medical officers of health did not have standard policies or
criteria to rely on in deciding when to post beaches.

At the same time, recreational use was quite different than now. Beach use
in Ontario is continuing to evolve away from historic patterns, partly in
response to our environmental history. The main impacts of aquatic
environmental laissez-faire were at urban and near urban sites, as these were
closest to the sources of the key water quality problems of the day. At the
same time, beach use was considerably more concentrated at these sites, and
considerably less flexible in its response to problems at individual sites,
than today. The automobile was less universal, and distant sites took longer
to get to. Access and support facilities at distant sites were not well
developed. Cottaging was much less widespread than today, when a large part
of the population has the option of semi-private swimming on water bodies
different and well removed from those that the urban centres are on. Also,
many people now have access to totally private water bodies in their own back
yards. In the terms used in Section 2.3, pool opportunities and nonhomebased
beach opportunities have become much more attractive relative to homebased
beach opportunities.

In addition, the range of available recreational opportunities other than
swimming has expanded enormously, and there are undoubtedly many Ontarians
for whom going to a nearby beach was once one of a very limited range of
recreational outlets who today would rank beach use (at least in their home
province) as very far down their list. Even more general shifts in supply,
broadly defined, have their effects: 30 years ago, most Ontarians worked in

non-air conditioned environments and almost none had air conditioning in their homes. If people wanted to cool off on a hot summer day, they could go swimming or go to the movies. Today most people spend at least part of their normal summertime daily cycles in air conditioned environments.

Even after these obvious supply determinants are taken into account, there seems to have been a fundamental shift in taste regarding beach recreation. There now appears to be quite limited demand for mass public recreation at crowded beaches backed by highly urbanized support facilities such as amusement parks - but for most Ontarians, this was beach use until the 1950s. There are quite a few near urban beaches where peak daily use is now well below records set 30, 40, or 50 years ago, despite the fact that, for example, Metropolitan Toronto's population has doubled since 1951. Perhaps most Ontarians never really wanted to crowd into a public beach with tens of thousands of others, but in any case far fewer had much alternative in the past than do today. Perhaps lingering memories of the major public health problems which often used to accompany near urban beach use have played a role in this demand shift. Certainly current awareness of exotic contaminants unknown to previous generations must be changing tastes regarding public beach use, even though the presence of these contaminants in Ontario waters is not now considered to have any significance for recreational contact.

Yet the past lingers in two ways which condition our present responses to problems. First, it lingers in both institutional and popular memories. Both governments and public are often like the armies which in 1939 were admirably equipped to fight the battles of 1914-18. Second, it lingers in sectors of the urban population which, whether out of choice or necessity, still resort to near urban beaches in the ways which were dominant in the past. People who do not own automobiles, pools, or private recreational property, and who do not have friends who do, are also not likely to have access to as wide a range of alternative recreational opportunities as the majority. Near urban beaches are easy and cheap, but if they are closed, there are fewer alternatives available to less mobile users. The user whose

effective range is 40 km from home will have 4% of the choice of the user whose effective range is 200 km from home, all other things being equal.

None of this is to dismiss the significance of contaminants in our waters, whether familiar coliform or exotic Mirex. A great many Torontonians would never swim at Toronto beaches, no matter how pristine they might become, because in summer the north shore of Lake Ontario is one of the coldest places to swim in Southern Ontario. Yet these nonswimmers might be just as upset about news of beach contamination as are people who want to swim but are confronted by placards or scared off by media stories - and rightfully so. Contaminated water does not signify a clean environment, and the people of this province have indicated very clearly that they place a high priority on as clean an environment as possible, especially when the affected environment is as close to home as the familiar beach down the street or across town. But what are in economic terms the existence and option values of clean water are beyond this study. They have a great deal to do with how Ontarians at large respond to beach contamination issues, but very little to do with how present or potential beach users respond to beach water quality, and this study is concerned with the latter.

Beaches are also vital to the economy of many smaller communities where tourism is a key industry and where natural environment swimming, and environmental quality in general, are major components of what attracts tourists. Fortunately, water contamination is less common at most of these locations than at near urban beaches. But on those infrequent occasions when beaches are contaminated in these communities, it is not just community pride and environmental aspirations that suffer, but also resident pocketbooks. At the same time, any economic losses which an affected community may suffer are at least in part translated into economic gains in communities offering clean substitute beaches.

So far, this discussion has tended to focus on public beaches, as does the study's mandate. However, we have suggested that one trend has been the privatization of beach recreation, especially through the growth of cottaging

and other forms of second home ownership. Owners of recreational homes with beachfront or with access to collectively owned beach, or legally public but effectively private beach, have a very direct stake in water quality. The privatization of beach recreation creates a very aware and powerful clean water constituency. Second home ownership in Ontario is continuing to grow, and it appears that beachfront recreational property is increasing in value faster than recreational or residential real estate in general. To the extent that their waters are contaminated, cottagers will make common cause with the general public to protest conditions and demand remedial action. And it may be expected that as the real market value of, or equity invested in, recreational properties continues to climb, the intensity of the reaction to water quality problems as potential depressants of these values will escalate.

All this is prelude to the summer of 1983, but has undoubtedly shaped what has happened since and provides essential background for this study. The summer of 1983 was unusually hot and dry in Southern Ontario, and was widely described at the time as the warmest summer of the 20th century. Conditions were ideal for the proliferation of coliform bacteria in offshore waters, and in accordance with the Water Quality Guidelines for Bathing Beaches as implemented by medical officers of health, there were significantly more and longer beach postings than usual (according to data compiled by Ministry of the Environment staff, about twice as many beaches as normal were posted once or more). As is usually the case, coliform-related postings tended to be disproportionately in or near major urban areas, where storm sewage runoff and the other common coliform sources are greatest in volume. These near urban postings coincided with unusually high demand for near urban beach use resulting from the unseasonably uncomfortable weather (no doubt combined, at least on Lake Ontario, with unseasonably comfortable water temperatures).

Beach closings therefore inevitably assumed a far higher profile in 1983 than before. The public 'agencies involved were ill prepared to respond to the situation. Barker's 1970 description of the Ontario institutional situation was basically still true.

"The decision maker has to make a choice between allowing beaches to remain open or closing them to the public within a system in which there is:
(1) insufficient knowledge of the degree of risk to health presented by bathing in water of various levels of quality,
(2) a lack of established guidelines concerning what constitutes a reasonable acceptance of risk,
(3) little knowledge of the attitudes and values of the people wishing to use these facilities, and only a limited conception of the demand for various kinds of water-oriented recreation, and
(4) pressure from local interests, both public and private, which may influence the availability of recreational opportunities (i.e. in a resort area local business groups will encourage the maximum use of local facilities)." (ref. 3.6, p. 38).

The Beach Management Program was initiated as a result of the summer of 1983. The main focus of this program was on accelerated efforts to identify and clean up or divert the most obvious sources of beach coliform contamination. Studies were also initiated to review microbiological standards for recreational water quality (Ontario Ministry of the Environment 1984/ref. 9.6) and the procedures followed by local health units in implementing current standards (Ontario Ministry of Health 1984).

Millions of dollars per year were now being spent on attempting to improve water quality at beaches. But it seemed that the funds available could only scratch the surface: separating all of the unseparated storm and sanitary sewers in Metropolitan Toronto, to mention only one commonly identified need, would cost many times the annual Beach Management Program budget for all Ontario. Ministry of the Environment staff had to set priorities; confronting the information gaps identified in Barker's point 3 above, they began to ask questions like:
- what is a recreational beach?
- is every site sampled by local health units a significant recreational beach?
- which beaches are most used?
- how much does water quality influence beach use, above and beyond the direct impacts of posting because of coliform exceedences?
- how important is the effect of water quality on beach use relative to the

effects of other physical, economic, and social determinants?
- how much is beach recreation worth?
- what are the economic benefits of cleaner water at beaches?

The present study could never hope to provide all the answers to these questions, but is intended to help begin to find those answers, and in that way help the Ministry of the Environment to more effectively target its water quality program expenditures.

2.2   BEACH USE AND ENVIRONMENTAL QUALITY: SOME FUNDAMENTALS

2.2.1   Beaches and Beach Use

For the purposes of this study, a beach is a strip of shoreline with the
physiographic, climatic, access, and ownership attributes necessary to
accommodate significant contact and noncontact recreation under favourable
aquatic conditions.   Under this definition, biological aquatic determinants
do not define a beach, but they can limit beach use. Site development and
management factors other than access and ownership, and social and economic
factors, also do not define a beach. Section 3.1 provides specific threshold
criteria for including beaches in the beach list developed as part of this
study.

Beach use includes all contact and noncontact recreational use of beaches.
It does not include offshore uses such as boating, except inasmuch as those
activities make use of beaches for access to water, and are in effect
"beach-based" for the duration of the occasion.

2.2.2   Contact and Noncontact Beach Recreation

The Report of the U.S. Department of the Interior Committee on Water Quality
Criteria (U.S. Department of the Interior 1968/ref. 9.10) defines "primary"
(i.e., contact) aquatic recreation as "activities in which there is prolonged
and intimate contact with the water involving considerable risk of ingesting
water in quantities sufficient to pose a significant health hazard" (p. 11).
In addition to swimming, waterskiing and surfing are specifically mentioned;
the study predates the windsurfing boom.   The Guidelines for Canadian
Recreational Water Quality (Canada Department of National Health and Welfare
1983/ref. 9.2) refer to "activity involving intentional immersion of the
body, including the head, in water or where such immersion is likely (e.g.
water skiing)" (p. 5).

For this study, contact beach recreation is defined as including swimming and

all its forms (wading, bathing, diving, etc.), plus waterskiing and windsurfing. However, windsurfing in particular is sometimes carried on with a degree of protection (wetsuit etc.) which reduces the significance of a number of determinants for the user and places him or her somewhere between the contact and noncontact poles. Noncontact beach recreation can include sitting, sunbathing, picnicking, walking, jogging, casual games, beach based boating and canoeing, heritage appreciation, etc. A single user occasion can include a mix of contact and noncontact activities. Fishing can also be a beach activity, but is influenced by a quite separate set of determinants, especially biological, and will not be dealt with in this study.

2.2.3   Determinants of Beach Use

For the purposes of this study, determinants of beach use refer to the factors that determine total use (over a season etc.) of individual beaches. Table 2.1 lists the determinants identified in this study. These were selected on the basis of a thorough review of the relevant literature (see Appendix 1, particularly topics 3, 8, and 9) and our own experience, plus discussion with our external reviewers (see Appendix 2). The determinants are grouped into five categories: aquatic (biological), physiographic, climate, development and management, and social and economic. For each determinant, the table indicates differential effects on contact and noncontact use and on homebased and nonhomebased use, suggests the type of variation in the determinant which can be expected on a short and long term basis, and notes whether site-specific data are available which would permit individual beaches to be classified or rated on the basis of the determinant. The table also identifies which determinants were selected for use in the beach list and the beach use model; in some cases, determinants were combined or varied for these purposes, and do not appear in the list or model in exactly the form shown in the table.

The determinants shown in Table 2.1 do not include factors that determine individual behaviour. In other words, the determinants govern the supply-demand equilibrium for the population, rather than the demand curves of

Table 2.1   Determinants of beach use.

	affects contact use?	affects non-contact use?	different effects on homebased and non-homebased use?	long term variation	short term variation	site-specific data currently available?	used in beach specific list	used in beach use model	comments
A q u a t i c									
Colour	X			variable	variable				refers to "objectionable" colour, or intense colour which affects visibility
Taste	X			variable	variable				
Odour	X	X		variable	variable		X	X	
Turbidity/clarity	X			variable	variable		X	X	
pH	X			variable	low/nil	some			extreme pHs irritate the eye
Indicators of bacterial contamination	X			variable	variable	some	X	X	must be perceived, either through posting or news/fear of contamination
Pathogens	X			variable	variable				must be perceived, either through posting or news/fear of contamination
Toxins	X			variable	variable				must be perceived, either through posting or news/fear of contamination
Filamentous algae	X	X		variable	seasonal		X	X	Cladophora
Blue green algae	X			variable	seasonal		X	X	algal blooms
Odour algae	X	X		variable	seasonal		X	X	
Weeds	X	X		variable	seasonal		X	X	aquatic vascular plants
Oil/grease/scum/foam	X	X		variable	variable		X	X	
Floating/beached objects	X	X		variable	variable		X	X	Includes flotsam and jetsam, dead fish, etc.
Insects/parasites	X	X		variable	variable				Includes insects, leeches, "swimmer's itch"

Table 2.1 (continued)

	affects contact use?	affects non-contact use?	different effects on homebased and non-homebased use?	long term variation	short term variation	site-specific data currently available?	used in beach list	used in beach use model	comments
Nuisance birds	X	X		variable	variable		A	A	
Physiographic									
Lake size	X	X		fixed	fixed	yes	A	A	
Beach length	X	X		alterable	fixed	some	X	X	
Wet beach width/slope	X			alterable	fixed	some	X	X	
Dry beach width	X	X		alterable	fixed	some	X	X	
Beach composition	X	X		alterable	fixed	some	X		
Backshore conditions	X	X		alterable	fixed				
Exposure	X	X		fixed	fixed				
Current/undertow	X	X		fixed	fixed				
Climate									
Water temperature	X			fixed	daily	yes	X	X	
Air temperature	X	X		fixed	daily	yes	X	X	
Sunlight	X	X		fixed	daily	yes			
Wind	X	X		fixed	daily	yes			
Development and management									
Ancillary facilities/ opportunities	X	X	X	alterable	fixed	some			
Parking	X	X	X	alterable	fixed	some			
Development aesthetics/ intrusions	X	X	X	alterable	fixed		A	A	
Incompatible recreational	X	X		alterable	variable				

Table 2.1 (continued)

	affects contact use?	affects non-contact use?	different effects on homebased and non-homebased use?	long term variation	short term variation	site-specific data currently available?	used in beach list	used in beach use model	comments
Admission charges	X	X	X	alterable	seasonal	some	A	A	
Management character and intensity	X	X	X	alterable	fixed				
Social and economic									
Long term regional demand characteristics	X	X	X	variable	fixed				Includes demographics, incomes, leisure time, alternatives, tastes, etc.
Travel times/tributary population	X	X	X	alterable	fixed	yes	X	X	
Travel ease	X	X	X	alterable	fixed	yes	X	X	comfort/discomfort of travel independent of modes and distance
Travel modes	X	X	X	alterable	fixed	yes	X	X	
Availability of substitutable sites	X	X	X	alterable	fixed	yes	X	X	other beach sites
Day of week/time of day	X	X	X	not applicable	daily	-		X	institutional constraint factor

Note: (A) - forms part of aesthetic parameter; a field assessment system is developed in this study, but no data on its application are available at present.

individuals. The determinant "long term regional demand characteristics" is the sum of all individual demand curves, and expresses the aggregate preference of the population for beach recreation in general. Factors that determine individual taste and preferences, other than those related to specific site attributes, are therefore not considered individually in this study. A preliminary analysis of Ontario Recreation Survey data (Ontario Provincial Secretariat for Resources Development 1977-79, volume 3, table I-3) suggests that swimming activity is unusually homogenous across the province relative to other common activities, and we therefore conclude that in Ontario, secular demand characteristics for swimming likely do not vary significantly within the province and do vary significantly only over long periods of time.

The list of determinants also assumes that there is a self-regulating character to the distribution of beach use in Ontario. It is assumed that throughout the province, there is enough publicly accessible beach supply relative to the demand for public beach recreation that user densities do not regularly reach levels which would limit use, independent of the other limitations already inherent in Table 2.1. Users avoid excessive densities by using alternative public beach sites, private beach opportunities, and other outdoor recreation opportunities. This assumption might not hold in a jurisdiction less favourably endowed than Ontario is with public and private recreation opportunities and access relative to population.

2.2.4   Swimming as a Proxy for Beach Use

While it is obvious that swimming is only one of the uses which occurs at a beach, at the same time beach use is a package of experiences. We assume that the possibility or expectation of water contact is for most beach users central to this package, even if contact does not actually occur or is not even planned in all cases. A location where the idea of water contact does not form part of the attraction for most users is not really a beach. It may be a very attractive natural or manicured waterfront area for walking, picnicking, etc., but will not normally sustain the complex of uses

associated with beach activity, and will also not normally sustain significant volumes of use other than for passive enjoyment or for recreational activities which are related to water only inasmuch as it serves as an aesthetic backdrop. As well, locations of this type usually do not attract significant volumes of use from more than local distances, and therefore yield low benefits per occasion. The only common aquatic biological factors which (at least logically) affect use at sites of this type are odour algae, heavy and/or odoriferous onshore deposits of filamentous algae or weeds, and concentrations of floating or beached objects, nuisance insects, and nuisance birds.

In most cases, shorelines of this type which do receive significant use are municipal parklands which happen to be located on waterfronts. Some urban waterfront sites combine beaches with incidental municipal parklands. For example, it can be argued that Toronto's Eastern Beaches consist of a strip in front of the boardwalk which is a true beach sustaining true beach uses, both contact and noncontact, plus municipal parkland on and behind the boardwalk sustaining typical park uses which (to a declining extent as one moves inland) are enhanced by the Lake Ontario backdrop. While aquatic aesthetics can significantly affect use at these sites, the types of use involved do not appear to represent the primary focus of the Beach Management Program.

We therefore conclude that it is reasonable to use swimming as a proxy for beach use. As will be seen, it would be extremely difficult to develop any kind of workable model of beach use without making this assumption.

2.3   BEACH RECREATION IN ONTARIO: AN OVERVIEW

2.3.1   Range of Activities

Beaches play a central role in recreation in Ontario. The very image of
Ontario as a place to live and to visit is conditioned by the presence and
availability of the many thousands of lakes, large and small, and by the many
hundreds of kilometres of beaches along their shores.

As noted in Section 2.2, this study and the beach use model developed in it
concentrate on the activity of swimming as the preeminent indicator of beach
use.   As also noted in that section, there is a considerable network of
associated and related activities which also contribute to beach use, and to
which the presence of beaches contributes. It involves little exaggeration
to refer to beaches as "the essence of the Ontario summer", and this section
will attempt to substantiate this assertion both qualitatively and
quantitatively.

The typology of activities conducted on Ontario beaches is rich and complex.
It includes both water-oriented and non-water-oriented activities, and
involves both use of the water itself and use of the linear shore
environment. The basic taxonomy of beach uses can be seen as follows.

-    Primary water-oriented activities:
     -    Contact:
          -    swimming, wading, etc.
          -    skin and scuba diving
          -    waterskiing
          -    windsurfing
     -    Noncontact:
          -    fishing
          -    boating
               -    motor boating
               -    canoeing

- sailing
- other boating
- Primary non-water-oriented activities:
    - Noncontact, beach oriented:
        - sunbathing
        - people watching
    - Noncontact, outdoor-oriented:
        - picnicking
        - recreational walking
        - recreational hiking
        - cross-country skiing
        - snowshoeing
        - recreational snowmobiling
        - natural and cultural heritage appreciation
        - casual outdoor sports (frisbee, softball, volleyball, etc.)
- Activities associated with primary beach use or access:
        - recreational driving
        - cottaging
        - camping
        - commercial resort use.

Clearly, it cannot be claimed that beaches are the only, or even the main, outlet for all of the above activities, but the aggregate volume of the activities which are done, are preferred to be done, or can be done on beaches is very high indeed. Furthermore, for many activities, the personal and social value of the recreational experience is greatly increased when the activities take place in a beach environment, because, as noted earlier, "the beach" basically defines an Ontario summer. This heightened experential value cannot as yet be documented specifically, unfortunately, but can only be surmised by considering the same activities occurring in other environments. For example, consider the value and social meaning of a picnic at a roadside table, versus one taken as part of an all day family outing to a beach.

By using Ontario Recreation Survey (ORS) results (Ontario Provincial
Secretariat for Resources Development 1977-79, volume 1) as a base, we can
estimate the approximate current Ontario participation rates and volumes for
the main recreation activities, some of which are associated with beach use
and some of which are substitutes or competitors for it. The data in Table
2.2 have been estimated for 1986 by a three step process. First, we amended
the ORS figures to include participation by children 11 years of age and
under by a method used in the Crown Land Recreation Study undertaken for the
Ministry of Natural Resources (Hough, Stansbury + Associates Limited et al.
1977). Then, trend data summarized in the Physical Activity Patterns in
Ontario surveys (Ontario Ministry of Culture and Recreation 1981, Ontario
Ministry of Tourism and Recreation 1983b), and our own appreciation of the
results of many other fragmentary surveys of recreation in Canada, were used
to adjust the amended ORS data to provide estimates of 1986 participation
rates and frequencies for the various activities. Then, these rates were
applied to the current estimated population of Ontario, about 9 million
persons.

2.3.2   Natural Environment Swimming versus Total Swimming

It must be realized that swimming, though it can be taken as the prime
indicator or proxy for all beach recreational activity, is not all conducted
at beaches. There are various data available, but they do not show the
complete picture on the specific shares of swimming which is done:
- in natural environments
    - at beaches
    - not at beaches
- in manmade environments
    - in public swimming pools
    - in private swimming pools.

Ontario Recreation Survey (ORS) data (for example, Ontario Provincial
Secretariat for Resources Development 1977-79, volume 3, tables III-17,
III-18, IV-10, IV-23) suggest that in the mid 1970s, about 60% of swimming

Table 2.2   Estimated recreational activity participation, Ontario 1986.

```
-------------------------------------------------------------------
                     participa-   occasions/   total occasions
activity             tion rate    person/yr    (millions)
-------------------------------------------------------------------

swimming               66%          20             180
recreational walking   56           40             360
recreational driving   63           18             162
recreational cycling   30           15             135
visit cottage          47           9.5             86
boating                38           7.2             65
fishing                37           4.9             44
picnicking             60           4.0             36
camping                28           3.0             27
personal nature        20           3.0             27
  appreciation
hiking                 22           2.7             24
softball, volleyball   25           2.7             24
recreational           15           2.0             18
  snowmobiling
cross-country skiing    8           2.0             18
waterskiing             8           0.8              7

-------------------------------------------------------------------
```

Source: see text.

occasions occurred in pools and about 40% took place in natural environments. The use of public sector swimming pools has remained in a stable slow growth pattern since the ORS was taken, and there is no evidence to suggest significant changes in recent years in the natural environment share of total swimming activity. Applied to the data in Table 2.2, this breakdown suggests that about 8 occasions of swimming per person per year take place in natural environments inside and outside Ontario. It is reasonable to assume that about one third of natural environment swimming takes place at nonbeach locations on lake and river shores such as docks, piers, rocks, etc. Thus, a value of 5 to 5.5 occasions of beach swimming per Ontario resident per year can be estimated. The results of our beach use model, which work out to 5.2 occasions of beach swimming inside and outside Ontario by Ontario residents, fall within this range.

Swimming in pools therefore accounts for about 12 occasions per person annually. This estimate, based on ORS data, is corroborated by reference to surveys of physical activity patterns in Ontario in the early 1980s (Ontario Ministry of Culture and Recreation 1981, Ontario Ministry of Tourism and Recreation 1983b). These were taken for four week periods ending in mid November and mid June, and showed overall participation rates for swimming, virtually all of which would be pool swimming because of the times of year. We estimate that swimming in private pools accounts for about 2 occasions per person per year in Ontario. This implies that the approximately 140,000 private pools in Ontario each sustain on average about 130 occasions of use per year. While the private pool sector is large and growing, it does not yet account for much more than 10% of overall swimming activity.

The question of activity volume versus activity value must be considered when beach swimming is evaluated, because on a per occasion basis beach swimming has a considerably higher value than pool swimming. In the absence of specific contingent valuation or willingness to pay data for swimming in Ontario, it is necessary to support our assertion that beach swimming has a higher value per occasion on a rough version of a user cost plus travel cost approach. Public pools draw users from a much shorter radius than beaches

do. Typical user surveys of municipal swimming pools show an average draw of
about 4 km, or about 20 minutes travel time. Charges to users range from
zero to about $1.00 per head. If we value travel costs as suggested in
Section 5.3, the average value of a pool occasion (including admission) is in
the $4 to $5 range. Beach use, on the other hand, draws users from longer
distances, including those involving overnight stays. For nonhomebased
users, it is necessary to factor out the other elements of the recreational
activity package from the swim at the beach, but even a very conservative
view of average travel distances and costs (with zero admission assumed)
suggests a beach swimming occasion value at least in the $20 range. This
value estimate can be compared with current admission charges to wave pools
and major water theme parks, which are in the $6 to $10 range.

Thus, if we take these somewhat crude estimates of value per occasion and
apply them to our estimated swimming occasions per person per year inside and
outside Ontario, we obtain the following relative valuation of beach swimming
versus pool swimming to the "average" Ontarian:

	value/occasion	occasions/year	value/year
pool swimming	$4.50	12	$54
beach swimming	$20.00	5.2	$104

In aggregate, therefore, we may infer that beach swimming has almost twice
the overall value of pool swimming to Ontarians.

2.3.3   Swimming Role in Homebased versus Nonhomebased Recreation

Swimming in natural environments (versus swimming overall, or swimming in
pools) is much more closely correlated with longer trips and tourism activity
than with homebased recreational activity. The import of this finding is
clear when economic valuations are being considered. Recreation which
involves travel and overnight or longer stays is economically more valuable
to society and to individual participants than is recreation which takes
place close to home. This will be true whether value estimates are derived
from user expenditures or travel costs, or user willingness to pay can

actually be accurately estimated.

We cannot here provide estimates of the role of swimming and beaches in the overall tourism and recreation economy of Ontario, but we can highlight some of the indicators of the high importance of beach swimming and beach use to nonhomebased and homebased recreation. On recreational trips that involved an overnight or longer duration, the Ontario Recreation Survey ranked the activities most frequently participated in (Ontario Provincial Secretariat for Resources Development 1977-79, volume 3, table II-18). There are some surprises in the results (the given activity was participated in in the given percentage of trips of the given type):

rank	fishing trip	boating trip	touring trip
1	fishing (100%)	swimming (100%)	visit friends/ relatives (100%)
2	swimming (74%)	motorboating (78%)	sightseeing (87%)
3	motorboating (47%)	fishing (49%)	swimming (54%)

From the above, it can be seen that swimming is in the top three activities noted for each of the main types of summer trip, among the 10 activities that were tabulated. Also, natural environment swimming was the main mode of swimming on such occasions, as will be seen below and in Section 2.3.4.

When swimming is involved in an overnight or longer recreation trip, the general rule is that the more urbanized the destination area, the higher the proportion of swimming takes place at pools as opposed to in natural environments. Some of these variations and their effects are shown in Section 2.3.4.

2.3.4   Regional Variations in Swimming Environments

The regional variation in environments used for swimming is quite considerable, as might be expected given the widely varying nature and character of Ontario's regions. The broad outlines of this variation, by homebased and nonhomebased occasions, are shown in Table 2.3.

Table 2.3   Regional variations in swimming environments, 1973-74.

destination region	% of homebased swimming occasions in		% of nonhomebased swimming occasions in	
	pools	natural environments	pools	natural environments
Ottawa/St. Lawrence	80%	20%	4%	96%
East Lake Ontario	34%	66%	6%	94%
West Lake Ontario	85%	15%	48%	52%
Metro Toronto	96%	4%	n.a.	n.a.
Southwest Ontario	71%	29%	35%	65%
Georgian Bay	32%	68%	9%	91%
Northeast Ontario	31%	69%	40%	60%
Northwest Ontario	47%	53%	5%	95%

Source: Ontario Provincial Secretariat for Resources Development, volume 3,
         tables III-17 and III-18.

The patterns of regional variation shown in the table are from the Ontario Recreation Survey and date from the mid 1970s, but since they apply to destination areas and to relative ratios of pools to beaches which have changed little if at all in the intervening years, they probably hold fairly closely today as well. From the patterns, it is clearly seen how much more heavily the high value nonhomebased occasions are weighted to the use of natural environments rather than pools for swimming. Also, the correlation between relative urbanization and pool shares of swimming is quite clear.

2.3.5   Trends in Beach Use

2.3.5.1   Trend to Shorter Distance Trips

There are several bodies of data available to investigate the amount and direction of change over the past few years in spatial patterns of recreational trips. Most research (Ellis 1982; Duffield 1975/ref. 4.5; Greig 1977/ref. 4.6; Knudson 1980/ref. 4.8; Burdge and Ospyszek 1980/ref. 5.14; Caulkins, Bishop, and Bouwes 1985/ref. 5.17; Zalatan 1983/ref. 5.93) has found that longer distance recreational trips have been reduced in frequency or in trip length, with weekend trips being affected most. Day trips are next most affected, and vacation trips the least. The automobile mode has not suffered much decline in proportion of recreational trips taken on a day or weekend basis, since it remains at over 90%. The air share of vacation travel has increased, although it still accounts for less than 15% of vacation trips.

The energy situation, with sharp price rises and images of severe supply constraints in the 1973-74 and 1979 periods especially, has been cited as the primary cause for the trend to shorter recreational trips. The recession of 1981-83 must also bear some of the blame for the more recently felt effects. Another possible cause, which has received little or no attention in the literature, may be shifting demographic patterns. Based on available trip length data for various activities, it can be argued that "key" or "important" activity and/or environment experiences will result in more and

longer trips. The ORS data show that swimming outdraws, in this sense, many other popular activities; in other words, it can attract people from farther away on average (see for example Ontario Provincial Secretariat for Resources Development 1977-79, volume 3, figures V-3 and V-8). It can be argued, but not proved with available data, that beach swimming may on average be a less "key" activity for parties with fewer children, and children per family have fallen since the mid 1970s. Thus, this factor could contribute to reduced average trip length distributions for swimming. On the other hand, parties of young adults without children might be willing to travel farther to beaches, being "unencumbered", but this also cannot be proved as yet.

The available data on highway travel show an interesting picture of slowing growth in the 1970s, decline during the recession period of the early 1980s, and resumption of growth since 1984. The picture for all travel on Ontario roads is shown in Table 2.4.

The data in Table 2.4 encompass travel by all types of vehicle and for all trip purposes. In specifically studying recreation purpose trips by passenger vehicles, it is necessary to concentrate on specific highway segments, and apply pattern analytic techniques to determine what the trends are. Ellis (1982) charted the volumes of recreational person-trips on key sectors of the Ontario provincial highway system in the vicinity of a selection of provincial parks of several types and sizes. The selection enabled comparison of park attendance and camping data to recreational traffic volumes. General findings were that all parks were affected over the 1973-81 period, but the most serious effects were felt in parks three hours or more drive from major population centres. Parks nearer to such centres (for example, Pinery) were relatively little affected. The most dramatic effect of the drop in long distance weekend recreational travel was seen in Algonquin Park, where the highest overall decline was registered. Most importantly, however, a weekend peak of 50%-60% in traffic volumes which existed in earlier years had entirely disappeared from Algonquin by 1981.

The results in the aforementioned paper, and various supplementary

Table 2.4   Ontario road travel, 1971-1985.

```
------------------------------------------------
           million vehicle-km    annual change
------------------------------------------------

1971            50,567              +4.5%
1972            56,132             +11.1
1973            60,812              +8.3
1974            63,434              +4.3
1975            64,423              +1.6
1976            64,948              +0.8
1977            66,190              +1.9
1978            69,317              +4.7
1979            72,161              +4.1
1980            72,492              +0.5
1981            70,906              -2.2
1982            66,284          ·   -6.5
1983            65,359              -1.4
1984            66,722              +2.1
1985            67,831              +1.7

------------------------------------------------
```

Source: Ontario Ministry of Transportation and Communications 1986.

calculations done by Ellis on a spot basis since then, lead to some approximate estimates of how much trip length distributions for beach swimming may have changed from the mid 1970s, when the ORS data were collected, to the present. We estimate that there has been a 15% downward shift in each percentile of trip length distributions for homebased beach swimming over the period. That is, a finding that 77% of homebased swimming trips were under 0.5 hours in 1974 would translate to 77% + .15(100-77)% = 79% in 1986. We estimate that for nonhomebased beach swimming over the period, there has been a 20% increase in percentages under 50%, and a 20% downward shift in percentiles above 50%. The original ORS data on trip length distributions for beach swimming, and the estimated 1986 distributions, are shown in Table 2.5.

The gravity component of the beach use model described in Section 4 has been calibrated to replicate the estimated 1986 trip length distributions shown in Table 2.5 as closely as possible.

2.3.5.2 Activity Trends

It is assumed in this study that any trends in swimming arising from the changing age structure of the population will be taken into account through the incorporation of updated age distributions in the demographic component of the beach use model. In other words, we are assuming that age- and sex-specific swimming participation rates will not change appreciably from one time period to the next.

There are, however, some trends in various activities which are part of or related to the swimming experience that merit comment here. The first is the recent arrival of water theme parks on the Ontario scene. These facilities provide major outlets for water-oriented recreation in many parts of the United States. Most typically, such a facility provides a large outdoor swimming pool with mechanically generated wave action, various slides, rides, other water play areas, hot tubs, sunbathing, and refreshment facilities. The first wave pool in Ontario was actually a public sector venture, opened

Table 2.5   Estimated beach swimming trip lengths, 1973-74 and 1986.

Homebased trips:
    hours from home   ≤0.5   ≤1.0
    % of trips 1973-74   77   91
    % of trips 1986   79   93

Weekend trips:
    hours from home   ≤1.0   ≤2.0   ≤4.0
    % of trips 1973-74   18   48   88
    % of trips 1986   20   54   95

Vacation trips:
    hours from home   ≤1.0   ≤3.0   ≤5.0
    % of trips 1973-74   21   63   83
  · % of trips 1986   20   70   87

Sources: 1973-74 - Ontario Provincial Secretariat for Resources Development
          1977-79, volume 3, tables V-2, V-3, V-4; 1986 - see text.

by the Hamilton Region Conservation Authority in 1981. Since then, at least eight more commercial wave pool based attractions have started up. While one has had severe financial difficulties, attendance at most appears to average in the 150,000 per year range, and the newly opened Sunshine Beach facility in the Claireville Conservation Area in Brampton is planning for 350,000 plus. Admission charges for adults range from about $6 to $10.

In aggregate, over the next two years or so, it may be expected that attendance at water theme parks will total about 1 million per year in Southern Ontario. This will represent a significant volume of business for the operators, but is unlikely to have a major overall effect on beach attendance except in specific local areas. The 1 million per year attendance level represents only about 2% of the total beach occasions accounted for by Ontario residents. On the other hand, in specific areas such as Niagara and Wasaga Beach, each of which now has more than one wave pool installation and where beach attendance is affected by factors such as erosion and cold waters, some significant effects may be felt in the next few years.

Another activity which has grown from almost nowhere a few years ago into a growing and popular pursuit is windsurfing (sailboarding). A windsurfer is inexpensive, highly portable (on a cartop), and relatively easy to use. It can be enjoyed by persons of widely differing age groups, although high proficiency requires agility, skill, and stamina. There are as yet no estimates of the volume of windsurfing in Ontario, nor of participation rates. It may be that the activity is in a stage of development similar to that of cross-country skiing around 1980. If so, we might surmise that windsurfing is now engaged in by about 1%-2% of the population, and that this might grow to the 6%-8% level over several years. Windsurfing may peak out at a lower level than cross-country skiing, however, since windsurfers, while inexpensive compared to other boat types, still cost several times as much as a cross-country ski package (entry level board about $700, versus $150 for a ski outfit), and the range of competing alternative activities in summer is greater.

Nevertheless, windsurfers are now noticeable on Ontario beaches, and will become more so in future. They can be enjoyed over a longer season than swimming, since wetsuits enable boardsailors to tolerate colder waters than swimmers. The activity can be and is conducted in waters that are posted for swimming because of coliform levels. In this case, the sailors are betting that their exposure to contaminated water will be brief and will not involve swallowing any, a surmise that depends on the skill of the sailor. The question of how many boardsailors perceive their sport as contact or noncontact (in contaminated waters) is an open one and might be further studied. Certainly, spot observations show that boardsailors often conduct their sport from posted beaches, whether or not other users are avoiding water contact in accordance with the posting.

2.3.5.3   Greater Awareness of Water Quality Problems

It is fair to say that awareness of water quality problems among the general public is considerably higher now than it was 10 years ago. Specific problems, such as the presence of dioxins in Lake Ontario and the frequent high coliform counts on beaches in several major urban centres, are now part of the public's general awareness. The question which is relevant to this study is: how much does this greater awareness affect the actual volume of use of beaches for swimming? Research to date on this subject is inconclusive (see for example Barker 1970/ref. 3.6 and Canada Department of the Environment 1981/ref. 3.9).

We are unable to estimate what the translation might be between Gallup Poll type broad measures of pollution awareness and actual beach use, but we will make some assumptions. The first is, that the posting of a beach will in fact result in no swimming taking place during the time of posting. This assumption is used in the beach use model. While this assumption may not be entirely realistic behaviourally, it is proper from a policy point of view. The intent of current legislation and policies is presumably that people should be discouraged from swimming during a period of posting because the health risk from doing so exceeds that which Ontarians feel should be an

acceptable aspect of outdoor recreation experiences in this province.

What we cannot do, and have not done in this study, is estimate whether there may be a carryover effect of posting a beach, which would tend to depress visitation when the beach is not actually posted. We assume that this effect is nil in our beach use model, and we can defend this assumption on the basis that nearly all beaches which are posted for prolonged periods are in high demand urban locations, such that the public eagerly awaits their reopening. It would be logical to assume that beaches posted for a short period are unlikely to experience a carryover effect. There are also obvious arguments in favour of the existence of a carryover effect; further research would be desirable, but in the meantime, as it needs to be quantified in the model, we have quantified it at zero.

If our assumptions regarding user response to awareness of contamination are incorrect, which could be proved or disproved by a detailed survey linking awareness, perception, and behaviour in chosen cases, then allowance for the direct or carryover effects could be made in the model.

BEACH RESOURCES: A DATA BASE

3.1   WHAT IS A BEACH?

3.1.1   Introduction

In Section 2.2, we defined a beach as a strip of shoreline with the
physiographic, climatic, access, and ownership attributes necessary to
accommodate significant contact and noncontact recreation under favourable
aquatic conditions.   Under this definition, biological aquatic determinants
do not define a beach, but they can limit beach use. Other studies have used
specific minimum physical criteria, for example:
-   Ontario Land Inventory - 660 feet minimum length
-   Ontario Recreation Supply Inventory - composition must be sand.

We have identified five threshold criteria for inclusion of beaches in our
list of beach sites significant to Ministry of the Environment planning
needs.   Our choice of criteria was limited to those parameters for which
information is available for most or all potential sites. The number of
potential beaches is very large, with about 3,300 available from the Ontario
Recreation Supply Inventory (ORSI) and about 1,500 sampled by local health
units (we assume that most of the health unit sites are replicated in ORSI).
Our objective was to weed out the large percentage of potential sites which
collectively account for only a small percentage of beach use in Ontario.

3.1.2   Beach Composition

Criterion 1: Beaches must have a predominantly sand composition.

This information is available in ORSI, and may also be readily available from
health units.

ORSI assumed that beaches did not have any capacity if they were not sand.
Shorelines predominantly composed of gravel, till, rock, etc. may be very
attractive as natural or manicured waterfront areas for walking etc., but
will not normally sustain the complex of uses associated with beach activity,

and will also not normally sustain significant volumes of use other than for
passive enjoyment or for recreational activities that are related to the
water only inasmuch as it serves as an aesthetic backdrop. As well,
locations of this type usually do not attract significant volumes of use from
more than local distances, and therefore yield low benefits per occasion. In
most cases, shorelines of this type which do receive significant use are
municipal parklands which happen to be located on the waterfront. Aquatic
aesthetics can be significant determinants of use at these sites, but the
types of use involved do not appear to represent the primary focus of the
Beach Management Program.

3.1.3   Dry Beach Width

Criterion 2: Beaches must have a dry beach at least 5 m wide.

This information is available in ORSI.

ORSI estimated beach capacity using a space standard for number of people per
unit of length of beach. This was done on the basis of a matrix of wet beach
(measured to 1.5 m depth) and dry beach width categories, converted from
Imperial to metric measure and reproduced below (Ontario Provincial
Secretariat for Resources Development 1975/ref. 8.4). While both wet and dry
beach widths were felt to be influencing factors, it was concluded that dry
beach width was a more powerful determinant, and as the matrix shows, a beach
with a dry beach width of less than 5 m was felt to have an insignificant
capacity per unit of length, regardless of wet beach width. We concur with
this conclusion.

People per front metre of beach:

wet beach			dry beach width (m)			
width (m)	<5	5-10	10-20	20-40	40-80	>80
<5	0.56	1.31	1.31	1.31	1.31	1.31
5-10	0.56	1.77	3.51	4.10	4.10	4.10
10-20	0.56	1.77	3.51	7.02	8.20	8.20
20-40	0.56	1.77	3.51	7.02	13.35	16.40
40-80	0.56	1.77	3.51	7.02	13.35	17.59
>80	0.56	1.77	3.51	7.02	13.35	17.59

3.1.4 Beach Length

Criterion 3: Beaches must be at least 100 m long.

This information is available in ORSI, and may also be readily available from health units.

If we assume that, all other factors being equal, use is more or less in proportion to beach length, then picking a length threshold has to be arbitrary. We selected a 100 m threshold because:
- our subjective opinion is that beaches of lesser lengths cannot as a rule sustain significant access and associated facilities or possess significant inherent attraction, and will therefore be limited not only in volume of use but also in the distance from which users are attracted and therefore in the benefits per occasion of use;
- this threshold eliminates large numbers of beaches listed in ORSI, but these are mainly commercial; most provincial park, conservation area, and major municipal beaches exceed this threshold.

There is one exception to this criterion. As will be discussed in Section 3.2, ORSI records for beach sites sometimes include more than one beach. Provided that a site is a single physical entity on a single body of water and under the administration of a single agency, at some types of sites multiple beaches can be expected to function as a single attraction from a
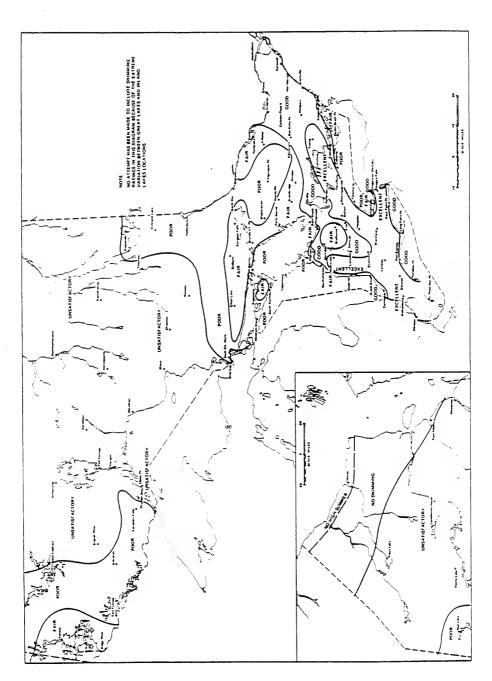
user point of view. Therefore, providing that there is at least one beach
100 m or longer at those sites, other beaches less than 100 m long but
meeting the other criteria are included in the agglomeration of beaches for
that site. We applied this rule to sites which normally have a common
access, parking, and facility base for all beaches within the site, namely
municipal, commercial, and private sites. Federal, provincial, and
conservation authority sites, on the other hand, tend to be more spread out,
and in particular often have separate beaches and differentiated access for
each day use and camping area. For the latter sites, we therefore continued
to exclude all individual beaches less than 100 m long.

3.1.5   Water/Air Temperature Regime

Criterion 4: Beaches must have a "poor" or better climatic classification for
swimming as defined by Crowe, McKay, and Baker (1977).

This information is available in The Tourist and Outdoor Recreation Climate
of Ontario (Crowe, McKay, and Baker 1977/ref. 8.2). The relevant map is
reproduced as Figure 3.1.

Crowe, McKay, and Baker developed five climatic suitability classes for
swimming in Ontario: unsatisfactory, poor, fair, good, and excellent. They
argue that to sustain any swimming, beaches must have water temperatures of
18°C or more inland or 14°C or more on the Great Lakes (the lower threshold
for the Great Lakes is because of the considerably greater variations around
means encountered there), accompanied by daily maximum air temperatures of
18°C or more. Swimmer satisfaction increases along with water and air
temperatures. Thus indexes of climatic satisfaction for swimming can be
constructed for each day and summed for the season for any location, given
information on the location's air and water temperature regimes. The classes
and isolines shown in Figure 3.1 are based on ranges of indexes for each
class. While this system incorporates several criteria developed by others,
we felt it preferable to adopt a system developed in what remains the
definitive work on climatic limitations to recreation in Ontario, rather than

Figure 3.1 Swimming classes.

From Crowe, McKay, and Baker 1977, vol. 2, fig. 2.149.

develop our own.

This criterion serves to exclude the area falling within the "unsatisfactory" class, as well as a "no swimming" area in the Hudson Bay Lowland. The degree of climatic satisfaction associated with the unsatisfactory class is very low, and the area so designated is restricted to central Northern Ontario and was not covered by ORSI (see Section 3.2).

3.1.6   Access

Criterion 5: Beaches must be road accessible.

This information is available from conventional maps.

No beach, no matter how attractive, will sustain significant use unless linked to the provincial network of roads (car ferry linkages included).

While there are many outstanding non-road-accessible beaches in the province, very few were inventoried in ORSI, and few if any are monitored by health units. Many would be eliminated in any case under Criterion 4.

3.2   BEACH LIST

3.2.1   Sources and Criteria

The primary source of records for the beach list was the Ontario Recreation
Supply Inventory (ORSI).   This inventory appears to provide near complete
coverage of significant Southern Ontario beaches as of 1975-80 approximately
(the area of coverage extends north to Highway 17 between Mattawa and Sault
Ste. Marie, but does not for the most part include North Bay, Sudbury, and
Sault Ste. Marie proper).   We obtained printouts consisting of individual
records for each recreational site (the definition of a site is discussed
further below) at which there is one or more beaches, plus individual records
for each beach.   The printouts were reviewed, and cleaned of erroneous
replicate records.   All of the remaining records were then evaluated against
criteria 1 through 5 described in Section 3.1, and only those meeting all
criteria were included.   An analysis of the ORSI beaches included in and
excluded from our list on the basis of the various criteria is provided in
Section 3.2.4.

In addition, provincial park swimming beach sites at which water samples are
taken, but which are outside the ORSI coverage area, are included. Only
partial data are available for these; the Ministry of Natural Resources does
not at present have a comprehensive inventory of its provincial park
facilities, so descriptive information on the individual beaches at these
sites is not available. Accordingly, these beaches are not considered in the
beach use model, and will be referred to in the rest of this discussion as
non-ORSI park sites.

It was originally intended to collect information on beaches sampled by local
health units as part of this study. This would have served as the other
major input into the beach list, and would have permitted analysis of the
relationship between beach significance and beach sampling. The following
information was to be collected from each health unit for each natural site
being sampled for recreational water quality on a regular basis:

- name of location
- name of water body sampled
- geographical reference
- ownership of location
- length of area sampled if more than one sampling point
- recent sampling history (whether sampled on a regular basis in two previous seasons)
- character of location (whether considered to be a sand beach).

The Ministry of the Environment decided not to proceed with the collection of these data within the present study.

3.2.2   The List

For the purposes of the beach list, a site may include more than one beach, but is a single physical entity on a single body of water under the administration of a single agency.   In most cases, ORSI sites meet this definition.   An ORSI site can include more than one beach, and it can generally be assumed that those beaches are noncontiguous within the site. However, an ORSI site can also include more than one water body. While ORSI provides geographic coordinates for sites, it does not provide coordinates for individual beaches, or the names of the water bodies that individual beaches are on.   Thus in ORSI sites under a single administration but with multiple beaches and water bodies, it is not clear which lakes which beaches are on (medium sized provincial parks are the prime example); the original ORSI questionnaires, the only places where this information was recorded, have been destroyed. We have used other sources (see Appendix 6) to pin down the water bodies wherever possible, but there are remain a few sites in our list which include, or may include, beaches on more than one water body.

With this qualification, each record in the list is therefore a site record (based on the above definition of site) and may include more than one beach. There are some cases of multiple records with the same name. These include:
- ORSI sites with the same name but different geographical coordinates;
- non-ORSI park sites in the same park but on different lakes.

Separate ORSI site records that have both the same name and the same coordinates, or that have different coordinates only because they are divided among two or more townships, have been agglomerated.

The list proper is reproduced in Appendix 3 and has also been provided to the Ministry of the Environment in disc form. Appendix 6, section A6.1 provides details on each data field (column) in the beach list and the procedures we used to incorporate the data shown. This beach list users manual provides future users with ground rules for interpreting and amending the list.

3.2.3   The Beach Resource

There are a total of 555 records in the beach list. Of these, 27 are non-ORSI park sites on which there is limited information, leaving 528 ORSI sites. As ORSI sites in destination zone 1 will be excluded from the model, the model uses 507 site records. Tables 3.1 through 3.7 provide some breakdowns on the 528 ORSI sites, which incorporate 584 beaches totalling 257 km in length.

Table 3.1 provides a breakdown of sites, beach numbers, and beach length by county and region. Table 3.2 shows the distribution of sites and beach length by Ministry of the Environment region, and Table 3.3 shows parallel distributions by administrative type, plus the average beach length for each type. The province, municipalities, and the commercial sector are the major players, together accounting for 89% of significant beach length. Table 3.4 shows the distribution of sites and length of beach for the destination zones designed for the beach use model, while Table 3.5 shows parallel distributions among the Great Lakes and the major inland waters of Southern Ontario. Lake Huron alone accounts for half of the significant beach length, and the Great Lakes-St. Lawrence system as a whole for over three quarters. Table 3.6 shows site and beach length distributions by temperature regime; only 36% of the significant beach length is rated as climatically good or excellent for swimming. Finally, Table 3.7 shows the percentages of beach length identifiable as having been posted once or more in each of 1984, 1985,

Table 3.1   ORSI sites in beach list, by county/region.

county/region	beach sites	beaches	metres of beach
Algoma	6	6	1801
Brant	1	1	100
Bruce	35	36	40155
Cochrane	0	0	0
Dufferin	1	1	150
Dundas	3	3	567
Durham	10	11	3337
Elgin	7	7	2850
Essex	11	16	8720
Frontenac	17	18	4851
Glengarry	3	3	510
Grenville	0	0	0
Grey	15	15	3665
Haldimand-Norfolk	7	8	5935
Haliburton	28	33	6441
Halton	1	1	270
Hamilton-Wentworth	9	9	9253
Hastings	10	10	1930
Huron	20	20	10514
Kenora	0	0	0
Kent	7	9	6780
Lambton	25	27	17791
Lanark	1	1	100
Leeds	5	6	868
Lennox & Addington	1	1	200
Manitoulin	11	12	8437
Metropolitan Toronto	5	9	5113
Middlesex	3	4	670
Muskoka	22	24	3703
Niagara	15	16	10501
Nipissing	10	10	2010
Northumberland	8	8	4510
Ottawa-Carleton	8	11	2879
Oxford	3	3	1653
Parry Sound	22	28	7222
Peel	6	6	1002
Perth	1	1	150
Peterborough	10	10	1520
Prescott	3	5	1067
Prince Edward	12	14	7964
Rainy River	0	0	0
Renfrew	27	30	6890
Russell	0	0	0
Simcoe	106	114	55344
Stormont	3	5	1439
Sudbury R.M.	0	0	0

Table 3.1 (continued)

```
-----------------------------------------------------------------
                            beach                     metres of
county/region              sites      beaches            beach
-----------------------------------------------------------------

Sudbury Terr. Dist.           2           2              524
Thunder Bay                   0           0                0
Timiskaming                   0           0                0
Victoria                      7           8             2744
Waterloo                      8           8             2385
Wellington                    3           3              441
York                         10          11             2112

Total                       528         584           257068
-----------------------------------------------------------------
```

Table 3.2   ORSI sites in beach list, by Ministry of the Environment
             region.

```
----------------------------------------------------------------
                            beach     metres of  % of beach
Ministry region             sites         beach     length
----------------------------------------------------------------

Southwestern                  127         92948        36%
West Central                   44         28765        11%
Central                       213         86096        33%
Southeastern                   94         29490        11%
Northeastern                   50         19769         8%
Northwestern                    0             0         0%

Total                         528        257068       100%

----------------------------------------------------------------
```

Table 3.3   ORSI sites in beach list, by administrative type.

```
--------------------------------------------------------------------------
                                                   average
                            beach     metres of      beach  % of beach
administrative type         sites         beach     length      length
--------------------------------------------------------------------------

national park                   1          6452       6452         3%
provincial park                56         54190        968        21%
other provincial               43         24415        568         9%
conservation authority         38          9828        259         4%
municipal                     166         93574        564        36%
commercial                    185         57546        311        22%
private                        32          8588        268         3%
unknown                         7          2475        354         1%

Total                         528        257068        487       100%

--------------------------------------------------------------------------
```

Table 3.4   ORSI sites in beach list, by destination zone.

```
--------------------------------------------------------------------
                              beach    metres of  % of beach
destination zone              sites       beach      length
--------------------------------------------------------------------

Northwestern                     0           0         0%
Northeastern                    21       11628         5%
Metro Toronto                    5        5113         2%
Golden Horseshoe                51       26475        10%
Southwestern                    97       58139        23%
Grey-Bruce                      50       43820        17%
Simcoe                         106       55344        22%
Shield                          79       18285         7%
Eastern                         93       30834        12%
St. Lawrence                    26        7430         3%

Total                          528      257068       100%

--------------------------------------------------------------------
```

Table 3.5   ORSI sites in beach list, by major water body.

```
--------------------------------------------------------------------
                              beach    metres of  % of beach
water body                    sites       beach      length
--------------------------------------------------------------------

Lake Superior                    0           0         0%
St. Marys River                  1         157         0%
Lake Huron                     184      129485        50%
St. Clair River                  2         268         0%
Lake St. Clair                   4         524         0%
Detroit River                    0           0         0%
Lake Erie                       33       30819        12%
Lake Ontario                    41       31617        12%
St. Lawrence River              13        3051         1%
Ottawa River                    15        5653         2%
Lake Simcoe                     13        3499         1%
unknown                         10        2835         1%
other                          212       49160        19%

Total                          528      257068       100%

--------------------------------------------------------------------
```

Table 3.6   ORSI sites in beach list, by temperature regime.

```
------------------------------------------------------------------
temperature regime             beach    ·metres of  % of beach
(see Figure 3.1)               sites        beach      length
------------------------------------------------------------------

poor                            91         47220        18%
fair                           224        118232        46%
good                           137         66713        26%
excellent                       76         24903        10%

Total                          528        257068       100%

------------------------------------------------------------------
```

Table 3.7   Postings of ORSI sites in beach list, 1984-86.

```
--------------------------------------------------------
                        metres of    % of total
year                       beach         beach
                 .        posted        length
--------------------------------------------------------

1984                       11597         4.5%
1985                       10140         3.9%
1986                       12164         4.7%

--------------------------------------------------------
```

and 1986. The percentage of significant beach length so affected has stayed more or less constant at 4% to 5%.

3.2.4   Beaches Included and Excluded

Tables 3.8 and 3.9 provide information on the effects of the beach list inclusion criteria on the ORSI beach data. Table 3.8 shows the numbers and lengths of beaches recorded in ORSI and included in the list, by county and region. ORSI records some 3,287 beaches; the list includes 584 of these, or 18%. However, these 18% of the beaches account for 60% of the total length of beach (425 km) recorded by ORSI. The table shows that the criteria tend to favour the inclusion of Great Lakes shoreline beaches more than "cottage country", inland beaches. The large majority of the "cottage country" beaches recorded in ORSI are very short, with most ancillary to commercial accommodation. Tables 3.9 shows numbers of ORSI beaches eliminated by the various criteria, by county and region. Most beaches were eliminated either on the basis of length alone (criterion 3), or two or more factors operating together.

At the request of the Ministry of the Environment, we have compiled a list of ORSI beaches located in the urbanized areas of urban municipalities with populations of 50,000 or over, but excluded from the beach list. This list, found in Appendix 4, includes for the excluded beaches the categories of information found in the beach list, and also indicates the criteria used to exclude these beaches.

Table 3.8   ORSI beaches included in and excluded from beach list.

county/region	ORSI beaches no.	m	List beaches no.	m	List beaches % of ORSI beaches no.	m	Mean length included beaches m	Mean length excluded beaches m
Algoma (a)	36	4311	6	1801	17%	42%	300	84
Brant	6	343	1	100	17%	29%	100	49
Bruce	83	48951	36	40155	43%	82%	1115	187
Dufferin	5	310	1	150	20%	48%	150	40
Dundas	7	872	3	567	43%	65%	189	76
Durham	62	8849	11	3337	18%	38%	303	108
Elgin	19	5117	7	2850	37%	56%	407	189
Essex	54	10321	16	8720	30%	84%	545	42
Frontenac	135	10753	18	4851	13%	45%	270	50
Glengarry	6	651	3	510	50%	78%	170	47
Grenville	5	275	0	0	0%	0%		55
Grey	45	5354	15	3665	33%	68%	244	56
Haldimand-N'folk	32	13277	8	5935	25%	45%	742	306
Haliburton	247	14918	33	6441	13%	43%	195	40
Halton	12	5235	1	270	8%	5%	270	451
Hamilton-W'worth	18	9560	9	9253	50%	97%	1028	34
Hastings	61	3793	10	1930	16%	51%	193	37
Huron	43	16248	20	10514	47%	65%	526	249
Kent	16	8704	9	6780	56%	78%	753	275
Lambton	50	20283	27	17791	54%	88%	659	108
Lanark	78	2694	1	100	1%	4%	100	34
Leeds	65	3261	6	868	9%	27%	145	41
Lennox & A'ton	17	857	1	200	6%	23%	200	41
Manitoulin (a)	71	22654	12	8437	17%	37%	703	241
Metro. Toronto	17	8084	9	5113	53%	63%	568	371
Middlesex	9	1158	4	670	44%	58%	168	98
Muskoka	369	16431	24	3703	7%	23%	154	37
Niagara	55	14761	16	10501	29%	71%	656	109
Nipissing (a)	71	4917	10	2010	14%	41%	201	48
Northumberland	69	7427	8	4510	12%	61%	564	48
Ottawa-Carleton	18	3330	11	2879	61%	86%	262	64
Oxford	12	1996	3	1653	25%	83%	551	38
Parry Sound	313	18355	28	7222	9%	39%	258	39
Peel	12	1438	6	1002	50%	70%	167	73
Perth	7	344	1	150	14%	44%	150	32
Peterborough	172	6130	10	1520	6%	25%	152	28
Prescott	6	1311	5	1067	83%	81%	213	244
Prince Edward	72	14579	14	7964	19%	55%	569	114
Renfrew	192	14421	30	6890	16%	48%	230	46
Russell	0	0	0	0				
Simcoe	439	71026	114	55344	26%	78%	485	48
Stormont	16	2216	5	1439	31%	65%	288	71
Sudbury R.M. (a)	1	21	0	0	0%	0%		21

Table 3.8 (continued)

county/region	ORSI beaches no.	m	List beaches no.	m	List beaches % of ORSI beaches no.	m	Mean length in-cluded beaches m	ex-cluded beaches m
Sudbury T.D.	3	577	2	524	67%	91%	262	53
Victoria	131	7116	8	2744	6%	39%	343	36
Waterloo	13	2642	8	2385	62%	90%	298	51
Wellington	19	1554	3	441	16%	28%	147	70
York	98	8026	11	2112	11%	26%	192	68
Total	3287	425451	584	257068	18%	60%	440	62

Notes: (a) Partial coverage only in ORSI. Districts totally excluded from
          ORSI are not shown in the table.

Table 3.9   Criteria on which ORSI beaches excluded from beach list.

| county/region | Total ORSI beaches | ....No. beaches excluded due to criteria......... | | | | | |
		1 (composition) only	2 (dry width) only	3 (length) only	5 (road access) only	combination	total
Algoma	36	1	6	8		15	30
Brant	6			3		2	5
Bruce	83	6	2	25		14	47
Dufferin	5			4			4
Dundas	7			2		2	4
Durham	62	5	3	19		24	51
Elgin	19	2		9		1	12
Essex	54		2	29		7	38
Frontenac	135	3	3	83		28	117
Glengarry	6			3			3
Grenville	5			5			5
Grey	45	1		22		7	30
Haldimand-N'f'k	32	5	4	9		6	24
Haliburton	247	2	5	141		66	214
Halton	12	1	2	4		4	11
Hamilton-W'w'h	18			4		5	9
Hastings	61			43		8	51
Huron	43	6	3	6		8	23
Kent	16	3	1	3			7
Lambton	50	1	5	15		2	23
Lanark	78			49		28	77
Leeds	65			44		15	59
Lennox & A'ton	17		1	10		5	16
Manitoulin	71	6	8	7	2	36	59
Metro. Toronto	17	4		1		3	8
Middlesex	9	3		1		1	5
Muskoka	369		2	204	3	136	345
Niagara	55	6		21		12	39
Nipissing	71		4	37		20	61
Northumberland	69	4	1	40		16	61
Ottawa-Carleton	18	1		3		3	7
Oxford	12			8		1	9
Parry Sound	313	2	7	152		124	285
Peel	12			2		4	6
Perth	7			2		4	6
Peterborough	172	2		136		24	162
Prescott	6					1	1
Prince Edward	72	5	4	6		43	58
Renfrew	192		8	66		88	162
Russell	0						
Simcoe	439	11	7	100		207	325
Stormont	16	2		8		1	11
Sudbury R.M.	1					1	1
Sudbury T.D.	3					1	1

Table 3.9 (continued)

	Total ORSI beaches	1 (comp- osition) only	2 (dry width) only	3 (length) only	5 (road access) only	combi- mation	total
county/region		........No. beaches excluded due to criteria.........					
Victoria	131	3		83		37	123
Waterloo	13			4		1	5
Wellington	19	2	1	11		2	16
York	98	1	2	32	1	51	87
Total	3287	88	81	1464	6	1064	2703
% of total ORSI beaches		3%	2%	45%	0%	32%	82%

BEACH USE: A MODEL

4.1   INTRODUCTION

The concept of a computer model intended to replicate the functioning of a complex social, economic, or geographical system is not new. The modelling process has been used for about two decades now in such situations. The main benefits of models arise from their nature: they offer a quick and convenient way to gain experience with and obtain insights into the real systems they represent.

There are many thousands of beaches in Ontario. The Ontario Recreation Supply Inventory collected physical data on some 2,800 accessible beach sites in Southern Ontario; of these, as shown in Section 3, about 500 are of sufficient capacity and quality to experience appreciable use. At present, however, use data are available for only a few dozen sites. These are limited to provincial parks and conservation areas, and none of the data provide direct estimates of swimming occasions. Swimming use can be inferred or interpreted from the available data, but there is no beach in Ontario where swimming occasions are measured directly on a regular or systematic basis.

It would be an expensive and lengthy task to perform use counts at even the 500 or so most used sites. By the time the task was half finished, conditions would have fundamentally changed. Furthermore, inaccuracies are built into any counting process, and there is no guarantee that the particular year chosen for observation would not be a singular anomaly in some important respect. The use of a model can enable a complete set of beach use counts to be estimated quickly and efficiently by simulating the behaviour of the system which generates beach use. A model can make use of whatever data are available to calibrate its simulation, and to improve its estimates as more data and better insights emerge.

The recent availability of the microcomputer has led analysts to attempt to model systems on them that formerly would have required the use of large mainframe computers. The advantages of the micros are their unsurpassed

convenience, speed of turnaround, high degree of interaction with the analyst, and low cost. Possible disadvantages are that they may not be powerful enough to do the job, and that the detail of the simulation might have to be sacrificed.

In using a microcomputer to model the use of beach sites in Ontario, we have broken new ground in the creation of an interactive spatial simulation. Spatial behaviour, such as patterns of travel to beaches, is commonly represented by a technique called the "gravity model". This technique sets up systems of equations representing the patterns of interaction between several hundreds, or even thousands, of zones. The standard application of this model thus requires a large and powerful computer, in terms of both memory capacity and operational processing speed.

To implement a gravity-based spatial model on a microcomputer, it was necessary to make the following major technical innovations:
- the whole system had to be conceived of as a two stage process, with a limited number of regions represented in a true gravity model, and site-specific beach use within a zone simulated in a secondary allocation model;
- the two stages of the model had to be governed by the same principles (of attraction, capacity, etc.);
- there had to be a procedure to incorporate all that is known about demographic and spatial variation in participation;
- the model had to have the capacity to reflect specific environmental conditions; namely, the effects of bacterial and aesthetic impairment on beach use.

The latter two features are unusual even in mainframe computer gravity models.

Figure 4.1 shows the conceptual arrangement of the beach use model as implemented, with reference to the various sections of the model as reproduced in Appendix 5. The logic flows from the population base through participation rates to the resulting volumes of beach swimming generated by

Figure 4.1   Beach use model structure.

Note: The numbers A5.1 etc. refer to model sections in Appendix 5.

each origin zone. Then, these volumes are distributed to destination zones using the gravity model principle. An index of attraction for swimming use is calculated for each beach site, and is used to allocate destination zone swimming volumes among individual sites.

The choice of software for this attempt to create a model of a new and different type in a medium never before stretched to such limits was, in fact, relatively easy. The generic spreadsheet was the only choice that would permit a great deal of data to be arrayed, manipulated, and displayed on a microcomputer in a "user friendly" manner. The exact brand of spreadsheet software to use took some experimentation, however.

The initial prototype development of the model employed Microsoft Multiplan, which was chosen for its ability, unique among microcomputer software, to run models involving linked spreadsheets. At the early stages of our work, it was not clear how many sites might have to be included in the model, and we thought that over 1,000 might have to be accommodated. If so, it was foreseen that each region would be represented by its own model, or spreadsheet, as a component of the second stage allocation process. These regional models would be linked together by a master spreadsheet containing the demographic factors and the interregional gravity model.

As the study developed, it became apparent that the number of sites would be in the few hundreds range, which could be accommodated in one spreadsheet within the memory limits of a standard office microcomputer. It also turned out that the running of linked spreadsheets under Multiplan was extremely slow, involving many minutes of disc access and recalculation for just a simple three sheet prototype. The prospect was that a model linking 10 or so spreadsheets with an average of 50 or so sites each might take hours to run through.

The integrated database and spreadsheet software Lotus 1-2-3 was tested for use as both the data base for the beach information and the program in which to build the model. Since a single sheet model was seen by this time as not

only feasible but also highly desirable, this software was adopted. Lotus 1-2-3 has the further advantage that it is the most widespread, and therefore the most familiar, spreadsheet software available. This was seen as likely to encourage more widespread hands-on use of the model when completed.

The model is reproduced in Appendix 5 and has also been provided to the Ministry of the Environment in disc form. Appendix 6, section A6.2 provides technical details on various aspects of the model and its operation. This beach use model users manual, read in conjunction with this section of the report, provides future users with ground rules for interpreting, testing, and amending the model.

4.2   ZONE STRUCTURE AND DATA BASE

4.2.1   <u>Origin and Destination Zones</u>

The model is based on geographic zones that can be constructed from spatial
building blocks, in this case the counties, regions, and districts of
Ontario.

The zone structure of the model as implemented contains eight origin and 10
destination zones within Ontario. This enables a somewhat greater level of
detail to be provided at the destination level, which is of greater interest
for studies of beach use. In particular, a single origin zone in the
Georgian Bay area, which is relatively low in population but high in supply
of beaches, is split into three destination zones to allow added detail on
analysis of supply and use.

Outside Ontario is also designated as a destination area. The model is also
designed to accommodate outside Ontario as an origin, but at present is
limited to simulating the flows of Ontario residents only. The data
currently available are too old to serve as reliable estimates of current
nonresident swimming by destination zone. More recent data on U.S. and other
visitation to Ontario do not enable swimming volumes to be broken out. If
such data become available in future, the model can readily be modified to
incorporate them.

The destination zones are described in Appendix 6, section A6.1. The origin
zones are the same, with the following exceptions:
-    all of Nipissing District is included in the Northeastern Ontario origin
     zone;
-    the Grey-Bruce, Simcoe, and Shield destination zones form a single
     Georgian Bay origin zone.

4.2.2   Data Base

The model includes 507 site records taken directly from the beach list data base, as follows.

.   As noted in Section 3.2, the model employs only Ontario Recreation Supply Inventory records from non-Northern destination zones (the Northwestern destination zone was not inventoried, and the Northeastern destination zone received only fragmentary coverage).

.   For the 507 relevant records, the following fields were isolated:
    -   name
    -   destination zone
    -   county/region
    -   Ministry of the Environment region
    -   administration type
    -   wet beach width
    -   dry beach width
    -   effective length
    -   temperature regime
    -   location/access code
    -   aesthetic code (blank at present)
    -   mean percentage of weeks posted 1984-86.

.   The isolated records were sorted by destination zone and alphabetically within each zone. The destination zone field was then discarded.

.   The data base was copied into the model.

4.3   SWIMMING PARTICIPATION

4.3.1   Population

The first section of the model (Population and Participation by Origin Zone, Appendix 5, section A5.1) is a section of the spreadsheet containing rows for each county, region, and district in Ontario, grouped by origin zone. The population of each county/region is broken down into six age groups; 0-11, 12-19, 20-34, 35-49, 50-64, and 65 and over. These age groups have been chosen because data on recreational activity participation rates by these groups are readily available from the Ontario Recreation Survey, except for the 0-11 group, for which participation must be estimated by other means.

Populations for these age groups can be either taken directly or easily calculated from several sources. These include the Census of Canada, Ministry of Revenue municipal enumerations, and Ministry of Treasury and Economics records and projections. The latter source is especially useful, since the Ministry's future population projections are available on-line as well as in the published series, Demographic Bulletin. These projections include five year age groupings by sex and county/region.

As data on a county/region basis are available for five year age groups only, the 10-14 age group must be broken down by the analyst. This can be done in proportion to the distribution among single years of age within this group, which is available for Ontario as a whole in the Census of Canada, or more simply if slightly less accurately by assuming equal distribution among the five single years of age.

For this study, the population data were taken from the 1981 Census of Canada. It was assumed that of those age 10 to 14, 40% were in the 0-11 and 60% were in the 12-19 age groups respectively.

4.3.2   Participation Rates

The next logical modelling step is to apply swimming participation rates for each age group to the population of that age group in each origin zone. These age-specific participation rates are shown at the top of Population and Participation by Origin Zone, Appendix 5, section A5.1, expressed as swimming occasions per Ontario resident per year. The participation rates for those age 12 and over are taken from the Ontario Recreation Survey (Ontario Provincial Secretariat for Resources Development 1977-79, volume 2, table II-2), which shows that for swimming, the rates differ primarily by age groups rather than by sex within each group. Thus the rates entered into the model are the averages of the male and female rates given for each age group in the ORS, weighted in accordance with the sex distribution of that age group in the 1981 Census of Canada. The participation rate for the 0-11 age group not covered by the ORS was estimated by the method referred to in Section 2.3.1.

Swimming participation rates vary by region in Ontario, and this is taken into account in the model by applying a regional participation factor (RPF) to each origin zone. The Ontario Recreation Survey provides average annual occasions of swimming per person by zone (Ontario Provincial Secretariat for Resources Development 1977-79, volume 1, table I-4). The ratio of each zone's occasions per person per year to the average occasions per person per year for all Ontario is a RPF. The ORS zones, singly or in pairs, coincide closely enough with our origin zones to provide acceptable values. Where two ORS zones more or less coincide with one of our origin zones, we have derived the RPF for our origin zone using 1981 population weights. We have assumed ORS values for Northern Ontario to be equally applicable to our Northeastern and Northwestern Ontario origin zones.

In each origin zone, the participation rate for each age group is modified on the basis of the RPF for that zone. These modified participation rates are then applied to the relevant population for each age group in each zone to yield numbers of swimming occasions per year expected from that age group;

these in turn are summed to yield total numbers of swimming occasions
generated each year by residents of each origin zone. The results are shown
in Occasions by Origin Zone, Appendix 5, section A5.2.

4.3.3   Beach Swimming Volumes

Total swimming occasions generated as outlined in Section 4.3.2 include all
types of and locations for swimming. The Ontario Recreation Survey also
contains information that allows homebased and nonhomebased swimming to be
differentiated, and swimming in natural environments to be separated from
swimming in pools.

The distinction between homebased and nonhomebased swimming is important for
two reasons. First, the patterns of spatial behaviour are very different for
the two types, so much so that it is necessary to represent each type by its
own gravity model.   The split between the two types is made by applying a
homebased swimming percentage to the total occasions calculated for each
origin zone (see Occasions by Origin Zone, Appendix 5, section A5.2). These
percentages were derived from Ontario Recreation Survey data (Ontario
Provincial Secretariat for Resources Development 1977-79, volume 1, table
I-8), adapted from ORS zones to our origin zones on a population-weighted
basis (see Section 4.3.2).

The model can now be used to split homebased and nonhomebased swimming
occasions in terms of the environments they take place in. This step is
quite important to a model of beach use, since, as noted in Section 2.3, the
majority of Ontario resident swimming occasions take place in pools. The
Ontario Recreation Survey (Ontario Provincial Secretariat for Resources
Development 1977-79, volume 3, tables III-17 and III-18) provides data that
can help estimate what fractions of both homebased and nonhomebased swimming
occasions originating in each origin zone occur in beach environments. A
great deal of interpretation and judgement is required to do this, for two
reasons.

-     The ORS data are for destination regions. While these are quite similar

to our origin zones, the data are describing behaviour of swimmers frequenting, rather than residents of, each region. The discrepancies are especially great for nonhomebased swimming.

- The ORS results differentiate between "natural environment" and pool swimming in destination regions, and natural environments can include more than beaches. We estimate that on average, about one third of swimming in natural environments takes place not at beaches, but from docks, piers, boats, rock shores, etc. This percentage will vary from region to region, however, depending on resource endowments.

To estimate the proportion of natural environment swimming that does not occur at beaches, we used the Crown Land Recreation Study undertaken for the Ministry of Natural Resources (Hough, Stansbury + Associates Limited et al. 1979), and our best judgement based on the type of nonbeach swimming opportunities offered in various areas of Ontario, to come up with percentage estimates. In assessing the natural environment shares of swimming originating from each origin zone, we have been guided by the aforementioned ORS data on natural environment swimming by destination zone. The large majority of homebased swimming occurs within the zone of origin, and thus less correction to the ORS proportions are needed. For nonhomebased swimming, appropriate corrections were made, depending on the home residence patterns of the swimming users of each destination region (see Ontario Provincial Secretariat for Resources Development 1977-79, volume 3, tables IV-1 and IV-11).

The resulting estimated beach swimming percentages of homebased and nonhomebased occasions originating from each origin zone have been entered in Occasions by Origin Zone, Appendix 5, section A5.2. Due to the approximate nature of these percentages, most are rounded to the nearest 5%. For each origin zone, these percentages have been applied to homebased and nonhomebased swimming occasions to generate homebased and nonhomebased beach swimming occasions. These last sets of figures thus represent the volumes of beach-using swimming occasions generated annually by each origin zone. Thus, these become the volumes to be distributed to destination regions by the dual gravity models in the next step of the simulation.

4.4   ORIGIN-DESTINATION ALLOCATION

The main mechanism for allocating the volumes of beach swimming participation
from origin to destination zones is a gravity model. It is not the intent of
this section to review the theory, concepts, and practice of gravity
modelling in general, but rather to convey how the technique was used in this
particular application.

The gravity model concept requires the following:
-    representation of incoming flows from the origin zones;
-    a matrix showing the "distances" from each origin to each destination;
-    a set of measures of the "attractive power" of each destination zone for
     the type of flow being modelled.

The flows from the origins are allocated to the destinations by representing
the distances in the matrix as functions which "deter" flow in some manner
which increases with distance.   Because the deterrence of distance for
recreational trips is considered to be primarily measured by the time
duration of trips, the distance matrix in this model consists of the hours of
driving time between the centroids of each zonal pair (see Time-Distance
Matrix, Appendix 5, section A5.3).

Obviously, these time-distance estimates involve some compromise, since the
origin and destination zones are quite large, and there are significant
variations in the range of possible time-distances between most zonal pairs.
Nevertheless, we estimated approximate population centroids for each origin
zone and beach supply centroids for each destination zone, and calculated
time-distances between centroids based on reasonable driving speeds and
"best" routes.   Further refinement of the zonal structure would add several
zones, or could even involve separate zones for each county/region. The cost
of this would be added complexity, which might not be repaid by proportionate
increases in accuracy given the present state of availability of data to
corroborate results.

As noted earlier, the behaviour of swimmers with respect to distance is very different on homebased trips than on nonhomebased trips. The reasons for this are obvious; homebased trips are much more constrained in their radius or length. The difference is such that the two types of trips are allocated each by their own origin-destination matrix (see Origin-Destination Matrixes, Appendix 5, section A5.4). The deterrent weighting of the travel distance is much greater for homebased swimming trips than for nonhomebased swimming trips, since the latter inherently involve an overnight or longer time period, and consequently less reluctance to travel longer distances to attractive swimming locations. For nonhomebased trips, the distance function is represented as e, the base of natural logarithms, raised to the power of minus 0.1 times the distance. For homebased trips, the distance function involves e raised to the reciprocal of minus 1.4 times the distance. These functions weight increasing distance much more heavily in deterring homebased than nonhomebased trips.

Flows from each origin zone to destinations outside Ontario are not estimated on a gravity basis. Instead, percentages have been applied to the totals of homebased and nonhomebased occasions originating in each origin zone, as shown in Origin-Destination Matrixes (Appendix 5, section A5.4). These percentages are based on information in the Ontario Recreation Survey (Ontario Provincial Secretariat for Resources Development 1977-79, volume 3, tables IV-1 and IV-11). We first adapted the data to our origin zones on a population-weighted basis (see Section 4.3.2). We then modified the percentages of nonhomebased occasions destined outside Ontario to reflect changes in travel patterns since the early 1970s, by assuming increases of 3 percentage points for the Metro Toronto and Golden Horseshoe origin zones, a 2 point increase for the Southwestern Ontario zone, and 1 point decreases for the Georgian Bay, Northeastern Ontario, and Northwestern Ontario zones. These adjustments were intended to reflect varying economic performance by region, combined with the lesser likelihood of increase in the St. Lawrence origin zone which already has the highest out of province destination proportions of any zone.

The literature (Coppock and Duffield 1975/ref. 7.6; Ellis and Van Doren 1966/ref. 7.7; Ewing 1980/ref. 7.8; Kirby 1974/ref. 7.9; Wilson 1974/ref. 7.13) notes that there are several types of gravity models that can be used, with the appropriate selection depending on what data are available, the constraints in the system being modelled, and the power of the computer available. In this case, it is assumed that there are no constraints on the travel corridors between zones, and also no overall constraints on beach use in destination zones. Naturally, there will be specific constraints at given sites on peak days, and at specific sites that may be closed due to contamination, but the assumption is that if a person wants at any time to swim at a beach somewhere in a given destination zone, he or she will be able to do so. The only constraints assumed apply to the origin flows, and in other words represent behavioural limits or constraints.

The form of gravity model chosen for this study is therefore what is known in the literature as an "origin constrained" gravity model. The technical details are not given here, but Appendix 6, section A6.2, contains some discussion of the nature of the formulas and how they are implemented.

4.5   BEACH SITE ATTRACTION AND USE

4.5.1   Introduction

Section 4.2 specifies the data fields incorporated into the beach use model from the data base. The present section indicates how the data contained in these fields are employed in estimating the attraction of and use at specific sites.   Site-specific data, attraction indexes, and use estimates are found in Beach Use by Destination Zone and Site (Appendix 5, section A5.5).   Since the county/region and Ministry of the Environment region data fields are incorporated into the model for information only, they are not reproduced in the section A5.5 printout or discussed below.

As will be seen, attraction indexes for individual sites and destination regions as a whole are used to indicate <u>relative</u> attraction, and therefore to influence origin-destination flows (on a regional basis) and to allocate destination zone use among sites (on a site-specific basis).   Therefore the values mentioned in the following discussions of the various parameters should be interpreted as weights rather than absolute values.   The values are multiplied together to generate attraction indexes which have no absolute quantitative significance.

4.5.2   Administration Type (ADM. in Appendix 5, section A5.5)

A weight is assigned to each of the administration type codes given in Appendix 6, section A6.1.   The weights are 1.0 for all types except commercial sites, which are assigned a weight of 0.2, and private sites, which are given a weight of 0.

The commercial weighting takes into account the fact that user access to commercial sites is most often through staying at a resort or campground, where the effective "admission charge" is high and the part that beaches play in overall attraction is relatively small.   Day use of commercial beaches is rare, and Ontarians tend to prefer public sector sites for this purpose.

The private weighting is intended to exclude private sites from the model. Entry to these sites is generally by virtue of membership in a club, attendance at a not for profit youth camp, etc. The overall volumes of use involved are not significant, and are not particularly relevant to an assessment of overall supply and demand flows.

4.5.3   Beach Widths and Effective Length (WET, DRY, E.L.)

The most basic measure of the attraction of a beach for users is its physical ability to accommodate use.   This implies a capacity measure related to physical dimensions.   In this study, we have taken as a point of departure the work of the Ontario Recreation Supply Inventory (ORSI) in relating physical parameters of beaches to potential user capacities (Ontario Provincial Secretariat for Resources Development 1975/ref. 8.4).

The first steps in ORSI capacity estimation are as follows:
- as described in Section 3.1, the widths of the dry beach, and of the wet beach to a 1.5 m depth, are used to select a space standard, expressed in people per front metre of beach;
- this space standard, when multiplied by the length of the beach, gives an estimate of the maximum instantaneous capacity of the beach.

In our model, we have followed this process in its basic form, but with two variations to make the model conform better with reality, based on available data and our own observations of beach use and capacity as they relate to differences in the basic physical parameters.

First, the ORSI space standard table, reproduced in Section 3.1, shows continually increasing capacity per front metre as wet beach widths increase.   We agree that this factor has some significance, particularly where the bottom drops off within 10 m of shore, but we do not agree that, for example, going from a 10 m to a 40 m distance to dropoff will increase beach use potential by as much as four times, which is what the ORSI table indicates.   We have, accordingly, assumed that capacities per front metre do

not increase with wet beach width above the 5 to 10 m wet beach width category.

Second, the ORSI method implies that every lineal metre of beach has the same potential for use as every other metre, regardless of total beach length. Many studies show that users tend to fill up the space on a linear beach starting with areas adjacent to the access points, and moving out in decreasing density from these points. Some studies suggest that a significant decrease in willingness to walk to recreational opportunities sets in at about 200 m. Accordingly, we use "effective length" rather than actual length in the model. The formula for this is given in Appendix 6, section A6.1. Effective and actual lengths differ only where average actual length of beaches at a site exceeds 400 m (this assumes access points located as centrally as possible), and the site lacks frequent access points providing more or less uniform access to the length of the beach or beaches. In other words, stretches of beach more than 200 m from an access point do not have the same effective capacity as more accessible stretches. The effect of the formula is to assume that these more remote stretches accommodate 20% of the use of the accessible stretches, all other things being equal. This constraint is embedded in the effective lengths entered in the model.

4.5.4   Temperature Regime (TEM.)

One of the factors involved in translating the instantaneous capacity of a site into its seasonal capacity is the length of season over which swimming will be possible at the site. This season length is a function of air and water temperature regimes, as well as local microclimatic factors such as winds, orientation, currents, tree protection, and so forth.

As noted in Section 3.1, Crowe, McKay, and Baker (1977/ref. 8.2) developed climatic suitability classes for swimming in Ontario, which we have used in the beach list (see Appendix 6, section A6.1 for codes). We have assigned the following weights to the classes.

0.75   poor
0.9   fair
1.1   good
1.3   excellent.

We have selected these weights for two reasons.

.   As noted in Section 3.1, Crowe, McKay, and Baker developed seasonal
     indexes of climatic satisfaction for swimming for the locations studied.
     The classes and isolines shown in Figure 3.1 are based on ranges of
     indexes for each class. The midpoints of these ranges, when adjusted to
     a base of 1, are distributed as follows: poor, 0.5; fair, 0.8; good, 1.2;
     excellent, 1.6.   However, the results of this distribution exaggerate
     capacity differences, and lead to unsatisfactory results when applied in
     the model.   Twice as much climatic "satisfaction" does not necessarily
     lead to twice as much use; it may lead to less than twice as many
     occasions, plus more satisfaction embedded in the occasions themselves.
     Effective season lengths in particular do not vary nearly as much as the
     midpoints suggest.   Accordingly, the weights above are a "smoothed"
     version of the original distribution, with the differences between each
     original value and 1.0 halved.

.   When the above weights are applied to the distribution of beach length by
     temperature regime shown in Table 3.6, the weighted average result is
     about 1.0.

4.5.5   Location/Access (LOC.)

Beach use is without question related to site location relative to population
centres and major access routes.   Therefore a parameter is required to
represent the relative degree of accessibility of each site.

The beach list includes a location/access coding system, which is described
in Appendix 6, section A6.1.   The following weights for the various codes

(proceeding from most to least accessible) represent our best judgement, and lead to satisfactory results when applied in the model.

    code 1   2.0
    code 2   1.5
    code 3   1.0
    code 4   0.7
    code 5   0.4
    code 6   0.2.

4.5.6   Aesthetics (AES.)

The model is intended to represent what happens to beach use, at specific sites as well as overall on a regional and provincial basis, when beach usability is degraded by aesthetic impairment. Accordingly, an aesthetic parameter has been incorporated into the model. However, as noted in Appendix 6, section A6.2, no data are available at present, and the aesthetic field is blank in the model for now.

We have built in a weighting system based on the aesthetic assessment system we have developed in Section 5.1.1. If this system is changed, the weights can be as well. The model and the weights are designed so that a midpoint weight of 1.0 can continue to be used at sites lacking specific information. The weights for the score categories suggested in Section 5.1.1 are as follows.

    ≥90 (excellent)   1.4
    80-89 (very good)   1.2
    70-79 (acceptable)   1.0
    60-69 (marginal)   0.8
    ≤59 (unsatisfactory)   0.5.

4.5.7   Posting (%P.X)

In a similar manner, the effect of coliform contamination which leads to beaches being posted is taken into account by the model. The model includes

the beach list data for the average percentage of weeks in which there were postings in the summers of 1984, 1985, and 1986 (see Appendix 6, section 6.1 for details). These data can be replaced with updated information or any other desired data at any time. The data can also be altered for any or all sites, to see how use patterns would respond to higher, lower, or no incidences of contamination. At present, the data in the model are used to lower site capacity in direct proportion to the percentage of postings. That is, a 50% posting value is assumed to lead to a 50% reduction in beach capacity and attraction.

4.5.8   Uncalibrated Attraction Indexes and Use Volumes (ATT., USE)

As noted earlier, attraction indexes are calculated for each site simply by multiplying for that site the appropriate weights and values as described above. The resulting products are divided by 100 simply to provide smaller, more manageable figures. These attraction indexes are then summed for each destination zone. The values shown for the Northwestern and Northeastern Ontario zones are assumed values, and are in proportion to the volumes of beach swimming use by Ontario residents in Ontario which originate in those zones, according to the model.

Origin-Destination Matrixes (Uncalibrated) (Appendix 5, section A5.4) shows estimated beach swimming volumes for all destination zones. However, as discussed in Section 3.2, our beach list does not include all beaches. It is necessary to make some provision for use at the large number of beaches not felt to be significant enough to be included in the data base. We have done this by showing an "unallocated" percentage at the bottom of each destination zone group in Beach Use by Destination Zone and Site, Appendix 5, section A5.5. These percentages are derived from Table 3.8, which shows the length of Ontario Recreation Supply Inventory beaches included in and excluded from the beach list, by county/region. The "unallocated" percentages in the model assume that the beaches inventoried in ORSI accommodate all beach swimming use, and that use per metre at beaches excluded from the beach list is 20% of use per metre at beaches included in the list.

The summed attraction indexes for each zone take the unallocated percentages into account. For example, if the sum of indexes at a zone's named sites is 900, and the unallocated percentage for the zone is 10%, then the summed index for the zone is 1000.

The summed attraction indexes (Aj) are inserted into Time-Distance Matrix (Appendix 5, section 5.3), from where they influence the gravity assignments that determine origin-destination flows and the final estimates of beach swimming use by destination zone (Origin-Destination Matrixes (Uncalibrated), Appendix 5, section A5.4). The beach swimming use estimates are in turn inserted into Beach Use by Destination Zone and Site (Appendix 5, section A5.6), where they are partitioned among individual sites in direct proportion to each site's percentage of the summed attraction index for its zone. In this way, the model's site-specific and regional components interact.

4.6   CALIBRATION AND VALIDATION

4.6.1   Procedure

The normal procedure for setting up and calibrating a gravity model involves having available a full set of actual counts of origin and destination volumes, and using them in estimating the equations for the model and comparing the results for overall goodness of fit. In this case, reasonable estimates of the full set of origin volumes are available, as noted in Section 4.3, but data on destination volumes are limited, especially at individual sites.

It is necessary to have some data at two levels to calibrate and validate the model; the destination zone level, and the individual site level. At the zone level, there are data available from the Ontario Recreation Survey (Ontario Provincial Secretariat for Resources Development 1977-79, volume 3, tables IV-1 and IV-11 for example) that enable a validation of interregional results. This validation must take into account changes in travel patterns which have occurred since the ORS data were gathered, as noted in Section 2.3.

The main method of calibration of the interregional model is the choice of gravity distance function, as described in Section 4.4. The parameters noted there were found to give a reasonable representation of origin-destination flows by zone and of average trip-length distributions.

At the individual site level, data are available for many of the provincial park sites in the model. Some of these, such as Pinery and Wasaga Beach, have hundreds of thousands of user occasions per year, and thus represent significant sources of beach supply. Others are smaller and more representative of beach opportunities in their vicinity that are provided by other jurisdictions, such as municipalities and conservation authorities.

As outlined in detail in Section 4.6.3, validation using provincial park data

involves integrating total visitor counts with user survey data which indicates swimming participation rates by visitors. Some of the problems with use of these data for validation are:

- day use or camping fees must be paid to gain entry to nearly all provincial park beaches (portions of Wasaga Beach being a notable exception);
- some parks have beaches which are relatively undeveloped as yet (for example, North Beach), while others sustain significant swimming use on small beach pockets (for example, Six Mile Lake);
- annual admission data are available in all cases where fees are charged, but user surveys are sporadic, leading to the possibility that unusually good or bad seasons were sampled for activity participation;
- the user surveys obtain percentages of campers and day users who swam, but for campers, it is not clear whether they swam on each day of their visit; thus conversion of camper days to swimmer days may result in an overestimation in some cases.

Another factor which affects validation of the model in its present form is that only Ontario resident occasions are predicted. Many provincial park beach sites sustain significant nonresident use, and this must be taken into account when reviewing park use data. Fortunately, there is considerable information on nonresident use patterns in the annual use statistics for provincial parks.

Given all of these caveats, the provincial park data were examined and compared to the initial model results. Some adjustments were made to the original use estimates to better reflect actual data (see Section 4.6.2).

Another set of results which was examined for consistency were the use estimates for the access points on the shore of Tiny Township, in Simcoe County. Jack Ellis is familiar with most of these sites, and has conducted some car and user counts in the past. These data were used in improving the consistency of the model's performance, and in adjusting the influence of such parameters as the wet beach width, as noted earlier in Section 4.5.

It is our opinion that the performance of the model in predicting use at individual sites is as good as can be verified using currently available data. It is likely that further refinements, which could easily be performed as outlined in Section 5.2, would add further to the accuracy and realism of the simulation. In any case, the simulation in its present form does provide the quick and interactive indication of the order of magnitude of beach use, and its sensitivity to demographic, access, physical, and environmental factors, that it was designed to do.

4.6.2   Calibration Constants and Calibrated Attraction Indexes and Use
            Volumes (CC, C.ATT., C.USE)

Beach Use by Destination Zone and Site (Appendix 5, section A5.5) provides a column of calibration constants for each site. These are intended to adjust results at specific sites to better reflect reality. In the model in its present form, the constants are normally 1, but for some provincial parks other values are shown, in line with the approach discussed in Section 4.6.1. In general, where the uncalibrated use estimates fell outside of a range of ±30% around our best estimates of use based on actual park data, a constant other than 1 was applied. The analyst can easily restore existing constants to unity, or make further changes to reflect new data. Where the constants have been applied, they suggest the direction and magnitude of known differences between the model and reality, and may thus guide future analysts seeking to improve the performance and explanatory power of the model. Potentials for improvement that we have identified are discussed in Section 5.2.

The next column shows calibrated attraction indexes for each site. The original attraction indexes are recalculated by multiplying them by the calibration constants. This means that the summed attraction indexes for each destination zone can change. These calibrated summed indexes (C.Aj) are fed back into Time-Distance Matrix (Appendix 5, section A5.3), from where they are used to influence gravity assignments in Origin-Destination Matrixes (Calibrated) (Appendix 5, section A5.4). The sole difference between the

uncalibrated and calibrated origin-destination matrixes is in their use of uncalibrated and calibrated attraction indexes respectively.

The calibrated estimates of beach swimming use by destination zone are then inserted into Beach Use by Destination Zone and Site. The final column shows calibrated use estimates for each site. Use is calculated by the same procedure as described in Section 4.5. The result is that the introduction of a non-unity calibration constant at any site can change use totals for all destination zones and use estimates for all individual sites, although due to rounding many of these changes may be imperceptible, especially outside the destination zone in which the constant is changed.

4.6.3 Data Sources for Validation

4.6.3.1 Ontario Travel Survey

The 1982 Ontario Travel Survey sampled over 4,300 residents of Ontario for information on all trips greater than 40 km one way. The main report (Ontario Ministry of Tourism and Recreation 1983a) was followed in 1985 by a series of seven reports on individual travel regions.

The survey is not of direct use in this study, since it did not ask specifically about beach use or swimming. The closest question asked was with respect to participation in outdoor or sporting activity. On the other hand, the survey does yield data such as trip length distributions which are useful for comparison with similar data from the earlier (1973-74) Ontario Recreation Survey, our main source of use data for the model, in order to ascertain how patterns of pleasure trips for various broad purposes and of various time durations have shifted over the "energy crunch" years. The comparison is not direct, since the regional boundaries and some of the definitions differ, but some broad comparisons still can be made.

4.6.3.2   Physical Activity Surveys

The Ministry of Tourism and Recreation and its predecessors have commissioned various surveys of physical activity patterns in recent years. The surveys, conducted as addons to the Ontario frame of the Canadian Gallup Polls of November 1978 and June and November 1979 through 1981, were reported on in Physical Activity Patterns in Ontario (Ontario Ministry of Culture and Recreation 1981, Ontario Ministry of Tourism and Recreation 1983b).

This series of surveys asked the 1,100 adults in the sample frame, "what type of physical activity, physical exercise or physical recreation have you engaged in, if at all, within the last month?". The restriction to "last month" in a survey run in June and November makes a comprehensive picture of swimming activity impossible. Also, it is not possible to distinguish beach swimming from total swimming, and the small sample frame does not permit regional analysis. Only three age categories (over 18) are used. Thus, these surveys have been of very limited use to our study.

4.6.3.3   Provincial Parks Statistics

Each year, the Ministry of Natural Resources issues a statistical summary of provincial park use. This includes for each park such data as numbers of visitors, daily entry permits sold, numbers of campers, camper nights and average length of stay, and average camping party size.

The data as such do not relate to beach use, and therefore have not been used directly in this study, but they do provide a context of and annual data on overall park use within which to interpret the user surveys that are taken at a selection of parks each year (see Section 4.6.1).

4.6.3.4   Provincial Park User Surveys

The Ministry of Natural Resources started a program of surveying provincial park users in 1974. Individual parks are surveyed on a five year cycle, more

or less, yielding by now a reliable record of trends and patterns of park users and their activities on a provincial and regional basis.

Results of surveys conducted between 1974 and 1980 are contained in an omnibus report <u>Provincial Park User Survey Program 1974-1980</u> (Ontario Ministry of Natural Resources 1983). This report provides an overview of the surveys done during that period. The results of the surveys conducted since 1981 have been published annually, with the variation that starting with 1984 day users and campers are reported on in separate volumes, and data are being published only once every two years.

The exact nature of the surveys varies somewhat from year to year, and some questions are usually added at individual parks to reflect the data needs of local management. The main core of the questions on visitor characteristics, activities, travel data, and expenditures has remained constant, however, enabling valid comparisons over time and area.

The size of the samples on which the reports are based varies quite widely from park to park, as does overall attendance. For example, of the 16 parks at which day users were surveyed in 1984, a sample of 100 or more was obtained at only five parks. But of the 18 parks at which campers were surveyed in 1984, 17 had samples of at least 100.

The main use of the user survey data is to provide estimates of swimming occasions at park sites, and thus enable the results of the model to be compared and calibrated to actual data (see Sections 4.6.1 and 4.6.2). Provincial park beaches are only a part of the beach inventory of any given zone in the beach use model, but in some cases they are important ones. For example, Wasaga Beach Park has officially recorded visitation of up to 1 million annually. As well, many users of Wasaga Beach are not counted, either because they enter at the uncontrolled parking lots at the east end of the park, or because they enter on foot from the cottages and motels behind the beach.

The data could also be used to validate model results at a destination zone level, although we have not done so. It is quite straightforward to identify what portion of a zone's beach inventory is represented by its provincial parks beaches, and then estimate total zone use by extrapolating up from the park use estimates. This would be a highly leveraged extrapolation in many cases, but would nonetheless be a valid and consistent approach.

Further uses of the park survey data will lie in the important areas of interregional travel patterns and trip related expenditures. The travel pattern data could be used to help validate the origin-destination flows. The expenditure data are relevant to valuation by the expenditure method, which we recognize is somewhat questionable, but nevertheless is of interest for comparison with other methods (see Section 5.3).

DEVELOPING AND USING THE DATA BASE AND MODEL

5.1   DATA COLLECTION NEEDS AND APPROACHES

5.1.1   Aesthetic Data

As part of this study, we have developed a field assessment system for beach
aesthetics, intended to cover the determinants of beach use so identified in
Table 2.1. Our system is designed to be undertaken by Ministry of the
Environment field workers as part of their regular duties. It is simple,
does not require any equipment other than a metre stick, and does not require
special training. With some practice, it should be possible to survey a
typical beach within 30 to 45 minutes. While any survey of this nature is
only a snapshot in time, we do not believe that individual beaches would need
to be surveyed more than once or twice a year, especially if unusual weather
conditions which might distort some environmental parameters from the norm
are avoided. For this reason, we recommend that surveying be done in the
morning, when water conditions tend to be calmer.

The instruction sheet, and forms for evaluating nearshore, onshore, and
backshore conditions, are reproduced on the next four pages.

The method was field tested in October 1986 at three sites: Sunset Beach Park
(Wilcox Lake, Richmond Hill), Hamilton Beach (Lake Ontario, Hamilton), and
Long Beach Conservation Area (Lake Erie, Wainfleet Township). While aquatic
biological conditions at the time were not typical of those during the
swimming season, the sites did provide a variety of environmental conditions,
and the field test permitted us to make considerable refinements to the
methodology.

As noted on the following sheet, the survey is designed to score beach
aesthetics out of 100. Based on the field test and our best judgement, we
propose the following categorization of scores, which would permit their
interpretation and could ultimately be used in the application of survey data
to the beach list and beach use model (see Section 4.5).

Aesthetics Field Survey/Instructions

Timing

.   This survey should be conducted before noon of any day between June 15
    and August 31.

Selection of Transects

1. Obtain an estimate of, or estimate, the approximate length of the beach.

2. Find, by visual estimate, the approximate midpoint of the beach. This
    point will be transect 3.

3. Divide the estimated beach length by 5 to determine the transect
    interval.   Measuring in either direction from transect 3, locate
    transects 2 and 1 at one and two intervals respectively from transect 3
    in one direction, and locate transects 4 and 5 similarly in the other
    direction.   If any transect is past the end of the beach, reduce the
    interval to maintain five uniformly spaced transects within the beach.

Selection of Sample Points along the Transect

1. Start at the water's edge.

2. The nearshore sample area is a square with the onshore side 1 m along the
    shore and the adjacent sides extending 1 m out.

3. The onshore sample areas are squares 1 m by 1 m. The first area begins
    at a point x times 30 cm from the water's edge, x being a single digit
    selected from a random number table. Successive areas begin every 3 m
    inland from the beginning of the first area. The areas end with area 10
    or at the end of the sand beach, whichever is less.

4. The backshore sample area consists of observations taken from the first
    onshore sample area, facing inland.

Scoring

1. Nearshore score for each transect = score from sheet x 0.625, out of 50.

2. Onshore score for each transect = total of scores from all sheets x
    1/number of sample areas x 0.8, out of 40.

3. Backshore score for each transect = score from sheet x 0.5, out of 10.

4. Total score for each transect = nearshore score plus onshore score plus
    backshore score, out of 100.

5. Total score for each beach = total of scores from all transects x 0.2,
    out of 100.

Aesthetics Field Survey/Nearshore Area

Transect ____   Score

1. Odour
    -   nondetectable or normal natural   10
    -   abnormal   0

2. Water turbidity
    -   more or less clear   10
    -   distinctly turbid   0

3. Filamentous and blue green algae patches
    -   absent   10
    -   <10% coverage of either the surface or the bed   5
    -   10%-25%   2
    -   25% or more   0

4. Other plant material
    -   absent   10
    -   <10% coverage of either the surface or the bed   5
    -   10%-25%   2
    -   25% or more   0

5. Oil/grease/scum/foam
    -   absent   10
    -   <10% coverage of the surface   5
    -   10%-25%   2
    -   25% or more   0

6. Non-natural floating or beached objects*
    -   absent   10
    -   <5% coverage of either the surface or the bed   5
    -   5% or more   0

7. Bird feathers, droppings, etc.
    -   absent   10
    -   <5% coverage of either the surface or the bed   5
    -   5% or more   0

8. Permanent development visible in the offshore vista
    -   none   10
    -   insignificant   8
    -   significant but not incompatible with a beach environment   4
    -   incompatible with a beach environment   0

Total   /80

*Natural objects would include those animal and mineral objects which would
be found in this location in a state of nature.

Aesthetics Field Survey/Onshore Areas

Transect ____   Scores

            Area (use second sheet if needed)   __ __ __ __ __

1. Algae					
- absent	10	10	10	10	10
- <10% surface coverage	5	5	5	5	5
- 10%-25%	2	2	2	2	2
- 25% or more	0	0	0	0	0
2. Other decomposing plant materials					
- absent	10	10	10	10	10
- <10% surface coverage	5	5	5	5	5
- 10%-25%	2	2	2	2	2
- 25% or more	0	0	0	0	0
3. Oil/grease/scum/foam					
- absent	10	10	10	10	10
- <10% surface coverage	5	5	5	5	5
- 10%-25%	2	2	2	2	2
- 25% or more	0	0	0	0	0
4. Non-natural beached or deposited objects					
- absent	10	10	10	10	10
- <5% surface coverage	5	5	5	5	5
- 5% or more	0	0	0	0	0
5. Bird feathers, droppings, etc.					
- absent	10	10	10	10	10
- <5% surface coverage	5	5	5	5	5
- 5% or more	0	0	0	0	0

Total   /50 /50 /50 /50 /50

*Natural objects would include those animal and mineral objects which would
be found in this location in a state of nature.

Aesthetics Field Survey/Backshore Areas

Transect ____   Score

1. Permanent development visible in the backshore vista
   - none   10
   - insignificant   8
   - significant but not incompatible with a beach environment   4
   - incompatible with a beach environment   0

2. Noise from the backshore
   - insignificant   10
   - significant but not incompatible with a beach environment   4
   - incompatible with a beach environment   0

Total   /20

≥90   excellent
80-89   very good
70-79   acceptable
60-69   marginal
≤59   unsatisfactory.

Obviously, it would take some years to begin to accumulate a significant body of data. The beach model is designed to take into account the facts that data would accumulate gradually and that some sites would never be surveyed.

5.1.2   Recreational Use Data

The development of a new system of recreational use data collection to supplement the beach use model is not as simple as the development of an aesthetic data collection system. The model is intended to simulate reality and estimate approximate volumes of use at individual beach sites. As the Ministry of the Environment is not in the recreational management business, the only purpose of a recreational data collection system would be to provide additional information to validate the model. We do not believe that there is sufficient information available at present to develop such a system for Ontario that would be significantly more precise than the model itself and could be carried out without a major user survey program. The latter would be more appropriately carried out by the agencies charged with management of specific sites, who are more qualified to do so than the Ministry is and who could more effectively integrate major survey programs with their management efforts.

The only proved system for generating reasonably accurate use information over a season is gate counts, combined with reliable survey data on visitor activity patterns. As we have used swimming as a proxy for beach use, the user survey component is essential. There is no beach site in the province where all visitors swim. The only sites where gate counts equal swimming activity are pools. The only agency with a comprehensive gate count plus user survey program is the Ministry of Natural Resources, for its provincial

parks (see Section 4.6.3). However, as noted in Section 4.6.1, there are problems even with the integration of these two data sources. Natural Resources could undoubtedly resolve this problem by spending more time and money on data collection; all that is required is an extension of present methods. Improvements in provincial park data collection, plus improved data collection at other sites with some gate count and user survey data (mainly conservation authority sites), is a promising avenue for obtaining better data for model validation, best undertaken by the management agencies themselves.

The principal group of sites where there is no potential for the gate count plus visitor survey approach to be undertaken, but where there is appreciable use, is municipal sites. In general, municipalities do not seem to place any priority on knowing how many recreational occasions occur at their beaches. This is undoubtedly at least in part because they recognize the difficulty of collecting data in an open access situation. The same applies to the Ministry of Natural Resources with respect to non-park, open access shorelines under its jurisdiction.

It is not too difficult to take instant counts of swimmers and beach users in an open access situation. This could be done by lifeguards at a supervised beach, or field workers at other beaches. The rules for taking instant counts from predetermined observation points can be easily set down, and the counts can be taken quickly. The problem is how to extrapolate these counts into estimates of occasions over a season.

Extrapolation requires an estimate of the average duration of a swimming or beach use occasion, plus instant counts on a random or stratified basis throughout the season, with the total number of counts being fairly large to maintain reasonable confidence limits. There are very few reliable data on the duration of occasions in Ontario, so for accurate estimates it would be necessary to rely on surveys at each site under study. As the duration of beach occasions is likely to vary considerably from day to day, sample surveys of users on a number of days would be required. The basic technique

is not too different from that frequently used for creel censuses of anglers. A statistically reliable creel census is a major undertaking, in terms of both field operations and data analysis.

We have also considered the use of aerial photographs. Air photos could replace the counts taken by lifeguards and other observers. Air photos of the quantity required to provide an adequate sample over the season would be very costly. Even if they were taken by private pilots on a volunteer basis, the sampling schedule could be much more easily disrupted by weather etc. than if the sampling were done by ground-based observers. Also, air photo interpretation requires some degree of skill and would be time consuming. The information gleaned from the photos would be of no value without the same user surveys required to accompany ground-based instant counts.

In summary, it would undoubtedly be possible to develop simple approximations to the above methods which would allow crude estimates to be generated. However, the precision of these estimates would not be significantly greater than that of the model estimates they would be designed to validate. Use estimates which would be of value for the task at hand could certainly be developed using conventional survey techniques, but would require a time and cost commitment which would only be realistic when undertaken by recreational management agencies with a wide variety of needs for such information and with management programs into which collection of such information could be integrated.

There are some specific circumstances where, if data are available from the agencies responsible for open access areas, they can be analyzed so as to be of some use in validating the model. The following paragraphs review the types of data which may be available and how they can be analyzed.

A common method of collecting visitation data at no-charge sites is to count vehicle entries by means of a hose-type axle counter. The reliability of hose counts may be fairly good at best, to very low at worst. Each situation must be evaluated on its own merits. The factors to convert such counts to

swimming occasions, such as vehicle occupancy and swimming participation rates, must of course still be estimated.

Instant counts taken at peak attendance times can be used (with great care) by fitting them into a context of known attendance patterns at nearby sites with similar characteristics. For example, if a given public beach site on a given water body has a comprehensive set of daily attendance statistics and known information as to swimming participation rates, instant counts at peak times on peak weekends at this site and, say, 12 other and somewhat similar sites on the same water body may be sufficient to estimate seasonal use volumes at all the sites. Comparison of the peak counts at the fully sampled and the unknown sites, and extrapolation of the estimates for the sampled site, will give initial estimates for the unknown sites. If local anecdotal knowledge is available to confirm that the peak and non-peak attendance patterns are similar at the sites - or if they differ in some describable manner - greater confidence can be placed in the extrapolation of the basic data from the sampled site to others in its vicinity.

Other data can be used to generate approximate estimates of swimming occasions that can be compared to model results. The following example illustrates how this could be done on a hypothetical Great Lakes beach accessible to cottagers behind the beach and transient day users.

. The shoreline is backed by four tiers of cottages on lots averaging 23 m (75 feet) in frontage. The beach in question is 400 m long, and can be therefore expected to serve about 70 cottages. If the available swimming season is assumed to be 60 days in the area, and if we assume the average cottage to produce three swimming occasions per available swimming day, we arrive at an estimate of 12,600 cottager swimming occasions per year.

. For transients, data are available on the numbers of cars typically parked at peak times on peak weekends, in this case 200. We can assume that these spaces will turn over (be used) more than once per day; say about 1.5 times per day on average. A usual estimate of persons per

vehicle visiting outdoor recreational facilities is in the 3.5-4.0 range, say 3.9. We shall assume that 90% of the beach users swim (this can be compared with data on provincial park day users in the area, if available). These peak use conditions will occur on only a given portion of the available 60 day season. This season will on average include 19 weekend and holiday days. Midweek use as a percentage of weekend use can be assumed, or observed through instant counts of parked vehicles. This fraction is typically around 30%. Also, a factor should be allowed for poor weather conditions; for example, a reduction of 20% may be appropriate in a fair summer, 10% in a good one. The transient swimming use estimate for the season would then be as follows:

- peak days: 200 x 1.5 x 3.9 x 90% = 1,053 occasions/day x 19 = 20,007 occasions/year
- off-peak days: 1,053 x 30% = 316 occasions/day x 41 = 12,956 occasions/year
- total use: (20,007 + 12,956) x 80% = 26,370 occasions/year.

. The cottage and transient use estimates would then be totalled. The resulting estimate of about 39,000 swimming occasions per year could then be compared with the model estimate. The results could also be compared with model estimates for nearby, environmentally comparable, and similarly accessible beaches, making adjustments for lengths.

5.1.3   Health Unit Information

As noted in Section 3.2, it was originally intended to collect information on beaches sampled by local health units as part of this study. It would still be desirable to collect from each health unit the information originally specified, namely:

- name of location
- name of water body sampled
- geographical reference
- ownership of location
- length of area sampled if more than one sampling point

- recent sampling history (whether sampled on a regular basis i
  previous seasons)
- character of location (whether considered to be a sand beach).

These data would have the following uses:
- there would be a complete list of sites sampled by health units, wh
  could be crossreferenced with the beach list and other Ontario Recreat:
  Supply Inventory sites to permit analysis of the relationship betwe
  beach significance and beach sampling;
- sites which would appear to merit inclusion on the beach list, but whic
  were missed by ORSI or are outside the ORSI coverage area, could b
  identified and added to the list;
- the monitoring agency field in the beach list could be completed (see
  Appendix 6, section 6.1);
- crossreferencing of the beach list with sampled sites would eliminate the
  problems discussed in Appendix 6, section 6.1 with respect to matching
  sites identified in Ministry of the Environment postings updates with
  beach list sites, and thereby considerably improve the quality of
  information in the percentage of weeks posted data fields in the beach
  list and the beach use model.

5.2   FURTHER VALIDATION AND DEVELOPMENT

5.2.1   <u>Nonresident Origin Data</u>

Information may become available to broaden the beach use model to include
swimming occasions originating from outside Ontario (see Section 4.2.1).
This would permit more accurate comparison of model results with site use
data that include both resident and nonresident users. It would also improve
the value of the model in terms of economic valuation; although the consumer
surplus accruing to nonresidents from use of Ontario beaches is not of
concern to the Ontario Government, the economic activity generated in Ontario
by nonresident visitation to our beaches certainly is.

5.2.2   <u>Additional Site Use Data</u>

For analysts wishing to further validate and develop the model, the easiest
and most rewarding steps will involve the use of additional sources of
existing data for validation. These may be expected to lie in the public
sector, in particular additional and more recent provincial park data, and
data from conservation authorities.

The use of additional provincial park data as they become available will
follow the process outlined in Section 4.6, where day use and camping
visitation statistics can be used along with activity participation data from
user surveys to estimate what the annual swimming use predicted by the model
should be for individual parks. The same caveats apply to new data as were
noted for existing provincial park data in Section 4.6, mainly that the
survey results yield participation during the visit rather than exact
swimming occasions, and therefore may result in slight overestimation of
swimming occasions by campers.

The data available from conservation authorities vary widely in their
coverage, content, and reliability. The major authorities have long series
of data on visitation to individual conservation areas (at least those where

fees are charged), and many have done user surveys that would enable activity participation, and hence occasions of swimming, to be estimated. In these cases, the authority data can be used for calibrating the model in the same manner as described for provincial parks. There is at least as much variation from underuse to intensive use of beaches among conservation areas as among provincial parks, with at least as many reasons for this variation. Most of the conservation areas included in the beach list charge admission, and therefore will be subject to the same cautions as are provincial parks when model results are compared with those from no-charge sites.

Data from no-charge sites will be the most difficult to obtain, and also the most difficult to convert to estimates of annual swimming occasions, but in those cases where they are available and amenable to analysis, they could be very valuable for further refining the model. The potentials for analysis of these data are discussed in Section 5.1.2.

When any of these data are compared against model results, the analyst must keep in mind the factors common to any data comparison, such as: was the sample season unusual in any way? were the regionally substitutable beaches affected in any unusual way in that season? were there any temporary environmental, management, etc. factors acting on the beach or its access?

5.2.3   Updated Demographic Data

There will soon be an opportunity to significantly update the model, as the results of the 1986 Census of Canada become available during 1987. The 1986 counts will show a continuing shift in Ontario's demographic structure. For example, the median age of Ontarians passed 30 in 1982, and by 1986 it undoubtedly increased by another year or more. This is only one simple indicator of the shifts; the demographic component of the beach use model is sensitive to changes in the six separate age groups it represents. Since the participation rates in swimming differ little by sex, and are relatively stable by age-specific group over time, changing the distributions among age groups should yield reasonable estimates of demographic effects on total

swimming occasions. The big question will be: will the effect of the aging population (which tends to reduce overall per person participation) outweigh the increase in population numbers?

The reader may question our reliance on constant age-specific participation rates in beach swimming. It is possible that age-specific participation rates in all swimming could increase over time, through more interest in swimming as a fitness activity, more availability of pools for fitness swimming, development of wave pools and water theme parks, etc. However, few of the future scenarios for fitness and recreation of which we are aware foresee much increase in beach swimming; if swimming participation does increase, it is likely to be largely in pools, mostly indoor, and mainly for fitness or theme park entertainment. Thus, the age-specific rates of beach swimming participation may tend to be quite stable over future years. As noted in Section 2.3, the advent of commercial water theme parks could reduce those rates, but only slightly in the near future. On the other hand, continuing growth in second home ownership could slightly increase beach swimming participation, compensating for any loss to theme parks.

5.2.4   Administrative Type Coefficients

The administrative type coefficients described in Section 4.5 are very crude, providing equal weight to all public sector sites and one-fifth that weight to commercial sites. Our intuition is that there may be some differences among sites which relate to administrative type, based on factors such as:
- some types of public sector sites (national park, provincial park, conservation authority) usually involve fees, while others (other provincial, municipal) usually do not;
- national and provincial park sites generally have a higher tourism profile than other public sector sites;
- some other determinants of beach use, such as types of ancillary facilities and opportunities and management character and intensity, are to a considerable extent correlated with administrative type.

However, as the main source of reliable data for validating the model is at present limited to one administrative type, provincial parks, we do not have sufficient data to even suggest the quantitative effect of these hypotheses. Future analysts may be able to make some progress in this direction with the aid of additional use data and their own speculations.

5.2.5   Temperature Coefficients

The method described in Section 4.5 for incorporating temperature regimes into the model is based on a comprehensive analysis of recreational climates in Ontario.   However, the work of Crowe, McKay and Baker (1977/ref. 8.2) is necessarily broad and general over large areas and does not take into account local microclimatic conditions which may result in considerable variation from regional patterns, especially with respect to water temperature regimes.   As well, our adaptation of this work to our model relies solely on our judgement insofar as the relationship between climatic conditions and swimming participation (as opposed to satisfaction) is concerned.   It would be a useful improvement if a closer correlation between air and water temperatures and actual swimming behaviour could be obtained, and applied on a more discriminating basis to geographic locations.   It is possible that such data and correlations could be built up over the next few years by compiling observations from provincial parks or other sites.   Even a small number of observations would permit some interpolation between or extrapolation beyond the temperature categories currently used in the data base and model, at least for the sites observed and nearby sites with similar characteristics.

5.2.6   Location/Access Coefficients

The categorization of sites in the beach list by location and access conditions described in Appendix 6, section 6.1, and the method described in Section 4.5 for incorporating this information into the model, is rather mechanical, relying on only six different possible weights.   Clearly, this system provides only a crude approximation of the real differences in

relative locational accessibility. There are straightforward procedures available which could improve this situation. Their disadvantage is that they would require much more time for each site's location coefficients to be determined.

Now that the basic feasibility of the model is established, and the initial learning curve of getting it to work and then through its first stage of refinement is over, it is possible to suggest a process whereby the location/access parameter could be freed from its current shortcomings. In so doing, it is important to note that in the intraregional level of the model, this parameter is intended to signify:

- closeness to regional population centres, including sources of visitor populations;
- closeness to major travel corridors, which not only provide access to distant populations but also are linear population sources in themselves.

The location parameter might then be developed to have two coefficients, the first being distance from population centres, and the second being distance from main travel corridors (not every provincial highway is necessarily a main corridor). The parameters could be quantified in kilometres, with the actual values rather than a category used, and weights could be applied to account for differing average speeds on roads of different classes or with differing traffic conditions.

5.2.7   Aesthetic Data

The gradual inclusion in the beach list and model of data from the aesthetic conditions survey described in Section 5.1.1 will likely improve the model's predictive powers. Our initial validation of the model, and review of sites where there was a significant difference between model use estimates and known use data, suggest that the inclusion of likely aesthetic weighting would reduce the discrepancies for many of the sites in question.

5.2.8   Improved Provincial Park Data

The Ministry of Natural Resources is currently compiling a comprehensive inventory of its provincial park recreational facilities. When this work is complete, it will be possible to update the information on provincial park beach sites in the Ontario Recreation Supply Inventory coverage area, and remedy the deficiencies in the non-ORSI park site records as described in Section 3.2.

5.2.9   Full Separation of Homebased and Nonhomebased Use Streams

At present, homebased and nonhomebased beach swimming use are treated separately in the model until the conclusion of Origin-Destination Matrixes (Appendix 5, section A5.4), at which point all occasions in each destination zone are summed for transfer into Beach Use by Destination Zone and Site (Appendix 5, section A5.5). This process assumes that homebased and nonhomebased users are equally affected by the various determinants of attraction to individual sites. In fact, this is not so. Factors such as location, aesthetics, and posting may influence homebased and nonhomebased users differently, resulting in differing relative attraction of zones and sites to each group. It would be possible to redesign and enlarge the model to encompass separate Beach Use by Destination Zone and Site sections for each type of use, with some differences in parameter weights between the two types. At the end of the process, homebased and nonhomebased use estimates could be summed for each site, and compared with actual data if available.

We believe that this approach would significantly improve the effectiveness and predictive powers of the model. It would also significantly improve the model's utility for economic valuation, as homebased and nonhomebased occasions have quite different values (see Section 5.3).

5.3   ECONOMIC VALUATION USING THE MODEL

The question of economic valuation of any recreation activity is a difficult one, as noted in the voluminous literature cited in Appendix 1. This section will not attempt to convince the reader of the absolute best way to undertake an economic valuation of swimming or beach use in general in Ontario - for it can be taken for granted that the "best" process would be both lengthy and expensive - but to show what can be done with the beach use model in its present form.

The model produces three major sets of data:
- annual swimming occasions generated by residents of each Ontario origin zone;
- the origin-destination matrix for swimming trips, leading to annual Ontario resident swimming occasions occuring in each destination zone;
- annual swimming occasions at specific beach sites.

Since the model is explicitly based on travel patterns, travel time and cost can be generated by the model to be used in valuation by the travel cost method (see Appendix 1).

Considering homebased swimming first, the origin-destination matrix of swimming occasions can be weighted by the time-distance value for each origin-destination pair (see Appendix 5, sections A5.3 and A5.4). This will yield measures of total person-hours travelled on an aggregate basis, on an origin-destination basis, or to a given destination zone. Total person-hours travelled to a destination zone can be divided by total occasions flowing into that zone to yield a weighted average travel time to that zone.

The average value of a person-hour of travel can be derived by standard means, of which the easiest may be to use the values which the Ministry of Transportation and Communications favours for inclusion in its benefit-cost studies of transportation improvements. At the time of writing, these values were:

- 16 cents per vehicle-kilometre
- $5.54 per hour of time on personal trips
- 2.9 persons per vehicle on personal trips.

The value of an hour of recreational travel can be estimated using the Transportation and Communications values, plus an assumed average speed. If we assume a speed of 75 km/h for interzonal recreation trips, which are mainly on highways or rural roads, we can calculate the value of one person-hour of travel as ($0.16 x 75 ÷ 2.9) + $5.54, or $9.68.

If a given site is assumed to sustain homebased use entirely, and the average travel time to get there is, for example, 0.9 hours each way (based on the weighted average travel time to that site's destination zone), then the average travel cost value of one swimming occasion at that site will be 1.8 x $9.68 = $17.42. If use totals 100,000 occasions per season, then the value of this use on a travel cost basis will be approximately $1.7 million.

In the case of nonhomebased use, the model can show the travel volumes to each destination zone as well as the weighted average travel time to that zone - it will be on average much longer than the homebased travel time to the zone - but the entire travel cost of nonhomebased trips cannot necessarily be assigned to swimming experiences. It will be necessary to assess some fraction of the cost as representing the value of the swimming occasions, and attribute the rest of the cost to other activities. The problematic part of doing this cost splitting is that the package of recreational activities in which the swimming occasion is embedded is highly variable by location within Ontario. For example, there are several notable locations where the beach is, in fact, the main draw: virtually all activities centre on it or on the fact of its existence. Wasaga Beach is a prime example. On the other hand, swimming at some beaches may be rather incidental to a visit to the area for some other main purpose, such as golfing, fishing, boating, visiting friends or relatives, and so forth.

The data gathered in the Ontario Recreation Survey (ORS) on activity packages are the most comprehensive available to show the mix of different activities people participate in in various environments (Ontario Provincial Secretariat for Resources Development 1977-79, particularly volumes 1 and 3). However, neither economic valuation nor even importance weighting of these packages were undertaken in the ORS, and the results cannot be explicitly interpreted in such terms. It is possible, however, for the intrepid analyst who wishes to come up with valuations that include nonhomebased swimming occasions and are at least discussable, to use the ORS data in combination with informed judgement. Thereby, some rough estimates, at least, of valuation of nonhomebased beach use could be made.

It also must be noted that for nonhomebased users, the trip cost is far from the total cost of the travel experience, and the costs of accommodation, food, and other goods and services associated with the travel period will have to be estimated as well. It goes without saying that these amounts are highly variable in individual situations; yet there are many regularities in them when considered on a broad enough area basis, over particular types of tourists, or in particular destination zones.

For example, let us assume that the hypothetical beach discussed earlier, with its hypothetical value of $1.7 million for homebased swimming use, sustains an additional 30,000 occasions of nonhomebased swimming. Let us assume that nonhomebased visitors travel an average of 1.4 hours each way to beaches in the destination zone in question. Using the parameters as before, each person-trip has a travel cost value of $27.10. If it can be estimated that average accommodation and food cost for visitors to the area is, say $29.00 per person-trip (such data are regularly available from Ministry of Tourism and Recreation surveys, the most recent of which was the Ontario Travel Survey (Ontario Ministry of Tourism and Recreation 1983a)), then the total cost of one person-trip involving a swimming occasion is $56.10. This procedure does not take into account multi-destination or multi-purpose trips. Dealing with multiple destinations is a complex problem, but some assumptions can be made regarding multiple purposes.

If the beach in question is in a highly water-oriented recreational area, it might be appropriate to allocate up to, say, 80% of the value of nonhomebased person-trips to the beach, or $44.88 per nonhomebased swimming occasion. If, on the other hand, the beach is in a small urban area such that most of its tourist use is by those visiting friends and relatives, then the accommodation and food value imputed might be only $8.00 per person-trip for example, and we might assume that only 20% of the value of person-trips should be attributed to the beach (the people come mainly to see Uncle Bob). In this case, the value of a nonhomebased swimming occasion would be only ($27.10 + $8.00) x 0.2, or $7.02. Thus, using these values as a range, and not taking multi-destination trips into account, the 30,000 swimming occasions incurred by nonhomebased users could be valued at somewhere between $200,000 and $1.3 million approximately.

At present, the beach use model can generate swimming occasion volumes for individual sites, and travel times and homebased-nonhomebased use splits for destination zones. Each destination zone's travel times and homebased-nonhomebased use splits can be assumed to apply to all sites in that zone. Possible refinements to yield site-specific splits between homebased and nonhomebased use are suggested in Section 5.2.9. In any case, as the above discussion shows, homebased use can be valued by quite simple assumptions, and nonhomebased use can be valued using somewhat more judgemental assessment and available supplemental data. Valuation by these means can be applied to an individual beach, to a given waterbody's beaches, to a given zone's beaches, or to the province's beaches as a whole. To the extent that any valuation based on the travel cost method is useful and effective in decision making, the suggested procedure can produce results more or less directly from the model.

5.4   DECISION MAKING

The purpose of this study was to begin the search for answers to some obvious questions about the relationship between beach use and environmental quality in Ontario, and thereby help the Ministry of the Environment to more effectively target its water quality program expenditures. In this final section of the report, we wish to suggest how the results of our work could assist in this decision making process.

This study is only part of a wider effort intended to identify overall priorities for recreational water quality management. This wider effort will require the identification and weighting of all the criteria that should determine the relative significance of specific sites, and therefore the relative merits of water pollution abatement and water quality protection efforts at those sites, from a public policy point of view. Our study has identified many of the relevant criteria, and provided a substantial information base on those criteria for a large number of sites. While the information provided here will no doubt be valuable for inclusion in future priority setting efforts, the approach taken in this study may be equally valuable, and could serve as a model for the more effective and systematic targeting of Ministry environmental management efforts in general. In the short term, pending wider priority setting efforts, this study should be valuable in assisting Ministry decision makers in more effectively allocating staff and funds for recreational water quality management.

The issues which arose in 1983 regarding microbiological standards for recreational water quality, and their implementation by health units, remain unresolved. Our study should provide a useful social and economic context in which the Ministries of the Environment and Health can better consider and resolve the standards issue, and develop better protocols for the implementation of whatever standards are adopted, including in particular some basis for health units to set meaningful priorities for their individual sampling programs.

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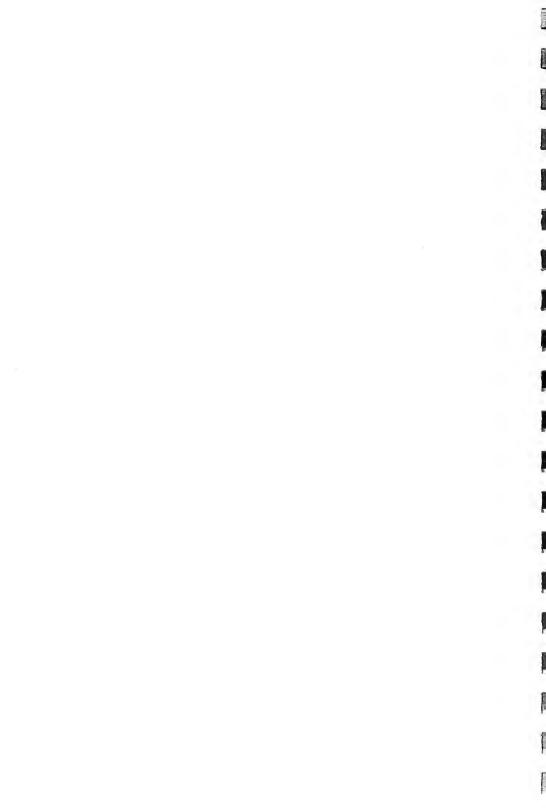   1983a   Ontario Travel Survey. Toronto.
    1983b   Physical Activity Patterns in Ontario - II. Toronto.

Ontario, Provincial Secretariat for Resources Development.
1977-79 Tourism and Outdoor Recreation Planning Study. <u>Ontario Recreation Survey.</u> 7 vols. Toronto.

APPENDIXES

APPENDIX 1
ANNOTATED BIBLIOGRAPHY

The bibliography is organized by topical headings (see list below). Where a given piece of literature fits more than one topic, cross-references are indicated. For example, 1.3 (x3) means that the reference numbered 1.3 also deals with topic heading 3.

The annotations provided are intended to convey the relevance of the item to the purposes of this study only, not to be a general review of content. The absence of an annotation indicates that the item was found to be of mainly background interest or relationship to this study. The reference numbers of annotated citations with a direct relationship to this study are underlined.

An asterisk means that the item was not reviewed by the consultants.

Topics

1. Bibliographies
2. Recreational Use of Beaches and Shorelines
3. Perceptions of Environmental Quality and Impacts on Recreation
4. Recreation Travel Behaviour and Substitutability
5. Economic Valuation of Recreation and Environmental Quality
6. Field Data Collection Methods
7. Microcomputer Database and Modelling Techniques
8. Biophysical Determinants of Beach Use
9. Water Quality Criteria for Recreation

1. Bibliographies

1.1 (x5)   Allton, D.   1979.   Valuing Outdoor Recreation Benefits: An Annotated Bibliography.   Monticello, Illinois; Vance Bibliographies (M. Vance, ed.); Public Administration Series.

1.2 (x5)   Binkley, C.   1977.   Estimating Recreation Benefits: A Critical Review and Bibliography.   Monticello, Illinois; Council of Planning Librarians.

1.3 (x3)   L.J. D'Amore & Associates Ltd.   1983.   Study of Trends in Canadian Environmental and Water Issues concerning Ontario and the Great Lakes Region.   Montréal; prepared for Ontario Region, Inland Waters Directorate, Canada Department of the Environment.
    Useful compendium of Canadian surveys of user perceptions of water quality.

1.4 (x3)   Marsh,   J.S.   1972.   Scenery Evaluation and Landscape Perception: A Bibliography.   Monticello, Illinois; Council of Planning Librarians, Bib. No. 304.

1.5   Tihansky, Dennis P.   1973.   Cost Analysis of Water Pollution Control: An Annotated Bibliography.   Washington; Environmental Protection Agency, U.S. Department of the Interior.

2.   Recreational Use of Beaches and Shorelines

2.1   Ditton, R.B., J.L. Seymour and G.C. Swanson. 1977.   Coastal Resources   Management: Beyond   Bureaucracy   and   the   Market.   Lexington, Massachusetts; Lexington Books.

2.2 (x4)*   Fairhurst, Kenneth B.   1979.   Coastal Recreation Analysis and Forecasts.   M.Sc. thesis, University of British Columbia.

2.3 (x6)   McDonald, C.D., and W.E. Hammitt.   1983.   "Managing river environments for the participation motives of stream floaters." Journal of Environmental Management, 16; pp. 369-377.
  "Motivation" is shown to be a function of affiliation, experiencing nature, action/excitement, skill development and solitude; measures of perceptions; relation to management processes.

2.4 (x5)   Stoevener, H.H. et al. 1973.   Multi-Disciplinary Study of Water Quality Relationships: A Case Study of Yaquina Bay, Oregon.   Corvallis, Oregon; Oregon State University, Agricultural Experiment Station, Special Report 348.

3.   Perceptions of Environmental Quality and Impacts on Recreation

3.1   Adams, Robert L.A.   1973.   "Uncertainty in nature, cognitive dissonance, and the perceptual distortion of environmental information: weather forecasts and New England beach trip decisions." Economic Geography, 49; pp. 287-297.
  Explores behaviour in response to changes in weather from forecasts to test cognitive dissonance theory.   Concludes that in the face of adverse results, users will tend to distort perception of weather information to reduce dissonance and rationalize behaviour; hypothesizes that this behaviour will underlie responses to other environmental hazards.

3.2* (x9)   Aird, W.J.   1973.   Measurement and Perception of Bathing Water Quality.   M.A. thesis, University of Western Ontario.

3.3   Baden, J.   1977. "Neospartan hedonists, adult toy aficionados, and the rationing of public lands."   G. Hardin and J. Baden (eds.), Managing the Commons.   San Francisco; W.H. Freeman.

3.4   Baden,   R.H.   1978.   "Social carrying capacity and user
satisfaction: an experimental function." Leisure Sciences, 1; pp. 241-257.

3.5*   Barker, Mary L.   1968.   The Perception of Water Quality as a
Factor in Consumer Attitudes and Space Preferences in Outdoor Recreation.
M.A. thesis, University of Toronto.

3.6 (x9)   Barker, Mary L. 1970. "Beach pollution in the Toronto region."
W.R. Derrick Sewell and Ian Burton (eds.), Perceptions and Attitudes in
Resources Management.   Ottawa; Policy Research and Coordination Branch,
Department of Energy, Mines, and Resources.
     Survey of user responses to environmental conditions at 12 south central
     Ontario beach sites.   Provocative discussion of lack of relationship
     between water quality standards and the true significance of water
     quality   to   recreational   use;   user perceptions and distortion of
     perceptions   of   water   quality problems; relationship between user
     knowledge and experience and perceptions of water quality problems.

3.7   Brookshire, D.S., C.B. Ives and W.D. Shulze.   1976.   "The
evaluation of aesthetic preferences." Journal of Environmental Economics and
Management, 3; pp. 325-346.

3.8   Calvin, J.S., J.A. Dearinger and M.E. Custin. 1972. "An attempt
at assessing preferences for natural landscapes."   Journal of Leisure
Research, 4; pp. 447-470.

3.9   Canada Department of the Environment. Inland Waters Directorate,
Ontario Region.   1981.   Public Perceptions of Water Quality in the Great
Lakes.   Burlington, Ontario.
     Among the findings of this survey are that aesthetics are the most
     influential factor in forming impressions of water quality, and that
     water quality is a secondary factor in affecting swimming use of the
     Great Lakes (although more important on Lake Ontario).

3.10   Craik, K. and E.H. Zube (eds.). 1976. Perceiving Environmental
Quality: Research and Applications. New York; Plenum Publishing Co.

3.11*   David, E.L.   1971. "Public perception of water quality." Water
Resources Research, 7; pp. 453-457.

3.12   Dearden, Philip.   1983.   "Anatomy of a Biological Hazard:
Myriophillum spicatum L. in the Okanagan Basin, British Columbia." Journal
of Environmental Management, 17; pp. 47-61.

3.13   Devall, B. and J. Harry.   1981. "Who hates whom in the great
outdoors: the impact of recreational specialization and the technologies of
play." Leisure Sciences, 4; pp. 399-418.
     With questionnaire data from users of reservoirs in Oregon, perceptual
     and   technological   clusters   of   recreationists   were   identified;
     implications for area management.

3.14   Ditton, R.B. and T.L. Goodale. 1973. "Water quality perception and the recreational users of Green Bay, Lake Michigan." Water Resources, 9; pp. 569-579.

3.15*   Ditton, R.B. and T.L. Goodale. 1974. "Water quality perception and attitudes." Journal of Environmental Education, 6; pp. 21-27.

3.16 (x6) Hanemann, W.M. 1984. "Entropy as a measure of consensus in the evaluation of recreation site quality." Journal of Environmental Management, 18; pp. 241-251.
     Applies Shannon's entropy statistic to measure convergence (consensus) in ordinal ratings of site quality; based on household survey; applies to quality of water-based recreation sites in Boston area.

3.17*   Harper, D.B. and J.D. Warbach (eds.). 1976. Proceedings, Visual Quality and the Coastal Zone Conference. Syracuse, New York; State University of New York, College of Environmental Science and Forestry.

3.18*   Hines, W. and W. Willeke. 1974. "Public perceptions of water quality in a metropolitan area." Water Resources Bulletin, 10.

3.19 (x2) Kreutzwiser, R. 1982. "Cottager associations in Ontario: an explanation of their involvement in shoreline issues." P.J. Ricketts (ed.), Coastal Studies in Canadian Geography, number 1. Halifax; St. Mary's University.
     Presents results of comprehensive survey of cottage associations in Ontario; perceptions of beach/water quality; relative importance of environmental factors.

3.20   Lucas, R. 1964. The Recreational Carrying Capacity of the Quetico-Superior Area. Washington; Forest Service, U.S. Department of Agriculture, Research Paper LS-8.

3.21   Neilsen, J., B. Shelby and J.E. Haas. 1977. "Sociological carrying capacity: the last settler syndrome." Pacific Sociological Review, 20; pp. 568-581.

3.22   Parkes, J.G.M. 1973. Public Perceptions of Water Quality and their Effect on Water-Based Recreation. Ottawa; Inland Waters Directorate, Canada Department of the Environment, Social Science Series No. 8.
     Investigation of user perceptions of impacts of water quality problems on recreational use and enjoyment at beaches on the Qu'Appelle system, Saskatchewan, Lake Champlain, Quebec, and the Atlantic coast, Nova Scotia.

3.23   Peterson, G.L. 1974. "Evaluating the quality of wilderness environments - congruence between perception and aspiration." Environment and Behavior, 6; pp. 169-193.

3.24   Peterson, G.L. and E.S. Neumann. 1969. "Modeling and predicting human response to the visual recreation environment." Journal of Leisure Research, 3; pp. 219-237.

3.25   Propst, D.B. and G.J. Buyhoff. 1980. "Policy capturing and landscape preference quantification: a methodological study." Journal of Environmental Management, 11; pp. 45-49.

3.26   Rabinowitz, C.B. and R.E. Coughlin. 1971. Some Experiments in Quantitative Measurement of Landscape Quality.   Philadelphia; Regional Science Research Institute; Discussion Paper No. 43.

3.27   Shafer, E.L. and M. Tooby.   1973. "Landscape preferences: an international replication." Journal of Leisure Research, 5; pp. 60-65.

3.28   Simpson, W.G. and G.K. Kamitakahara.   1971.   Opinions on Recreation and Pollution in Lake Ontario. Toronto; Great Lakes Institute, University of Toronto; publication PR43.
    Survey of Lake Ontario shore users, indicating that "pollution" effects on use are significant and describing various types of impacts affecting use.

3.29 (x6) SPR Associates Inc.   1985.   Predicting the Presence of Filamentous and Odour Algae: A Pilot Survey of Cottagers on Ten Ontario Recreational Lakes.   Toronto; prepared for Ontario Ministry of the Environment.
    Reports on a test survey of cottagers on South Shield lakes to determine if perceptions would allow accurate identification of algae problems. Useful as an exploration of impacts of algae on recreational use and enjoyment, and as an approach to collecting field data on aesthetic impairment.

3.30   Wall, G. and J.S. Marsh. 1982. Recreational Land Use. Ottawa; Carleton University Press.
    Gives an evolutionary and historic overview of topic.

3.31   Wall, G. 1982. "Recreation resource evaluation: changing views of the land as a recreation resource." Chapter 2, Wall and Marsh 1982.

3.32   Zube, E.H., R.O. Brush and J. Fabos (eds.). 1975. Landscape Assessment: Values, Perceptions and Resources. Stroudsburg, Pennsylvania; Dowden, Hutchinson and Ross.

4. Recreation Travel Behaviour and Substitutability

4.1   Baron, M. and M. Shechter. 1973. "Simultaneous determination of visits to a system of outdoor recreation parks."   Regional and Urban Economics, 3; pp. 327-359.

4.2 (x5)   Cicchetti, C.J.   1973.   Forecasting Recreation in the United States.   Lexington, Massachusetts; Lexington Books.

4.3 (x5)   Cicchetti, C.J., A.C. Fisher and V.K. Smith.   1973.   "Economic models and planning outdoor recreation."   Operations Research, 21; pp. 1104-1113.

4.4 (x5)   Christensen, J.B., S.K. Humphreys and C. Price.   1985.   "A revised Clawson method: one part solution to multidimensional disaggregation problems in recreation evaluation."   Journal of Environmental Management, 20; pp. 333-346.
    Refines Clawson's travel cost method for multipurpose trips and multimode journeys.

4.5   Duffield, B.S.   "The nature of recreational travel space." 1975.   G.A. Searle (ed.), Recreation Economics and Analysis.   Papers of Symposium on Recreation Economics and Analysis, London Graduate School of Business Studies.   Burnt Mill, Essex; Longmans.
    Calls for improvements to gravity models, since distance effects vary with journey length and activity.

4.6   Greig, P.J.   1977.   "Forecasting the demand response to changes in recreation site characteristics."   G.H. Elsner (ed.), State of the Art Methods for Research, Planning and Determining the Benefits of Outdoor Recreation.   Washington; Forest Service, U.S. Department of Agriculture.

4.7   Harris, B.S. and A.D. Meister.   1983.   "The use of recreation analysis in resource management: a case study."   Journal of Environmental Management, 16; pp. 117-124.

4.8   Knudson, D.M.   1980.   Outdoor Recreation.   New York; Macmillan.

4.9 (x5)   Price, C.   1977.   "Cost-benefit analysis, national parks and the pursuit of geographically segregated objectives."   Journal of Environmental Management, 5; pp. 87-97.

5. Economic Valuation of Recreation and Environmental Quality

5.1   Abel, Fred H. and Dennis P. Tihansky.   1974.   "Methods and problems of estimating water-quality benefits."   American Water Works Association Journal, 66; pp. 276-281.
    A thoughtful discussion from an environmental engineering viewpoint.

5.2   Anderson, F. and N. Bonsa.   1974.   "Allocation, congestion and the valuation of recreation resources."   Land Economics, 50; pp. 51-56.

5.3   Anderson, L.G.   1980.   "Estimating the benefits of recreation under conditions of congestion: comments and extension."   Journal of Environmental Management, 7; pp. 401-406.

5.4   Anderson, R.W.   1975. "Estimating the recreation benefits from large inland reservoirs."   G.A. Searle (ed.), Recreation Economics and Analysis.   Papers of Symposium on Recreation Economics and Analysis, London Graduate School of Business Studies. Burnt Mill, Essex; Longmans.

5.5   Beaman, J. and G. Gauthier.   1977. Guidelines for Social and Economic Impact Studies. Ottawa; Parks Canada, SERD Report 77-13.

5.6   Beardsley, W.   1971.   "Bias and noncomparability in recreation evaluation models." Land Economics, 47; pp. 175-180.

5.7   Binkley, C.B. and W.M. Hanemann. 1982. The Recreation Benefit of Water Quality Improvements: Analysis of Day Trips in an Urban Setting. Washington; Environmental Protection Agency Report EPA-600/5-78-010.

5.8   Bishop, R.C. and T.A. ·Heberlein.   1979. "Measuring values of extramarket goods: are indirect measures biased?"   American Journal of Agricultural Economics, 61; pp. 926-930.
    Addresses criticism of the contingent valuation method as being hypothetical, by showing that rather than overstating willingness to pay, contingent valuation generally provides conservative estimates.

5.9   Bowes, M.D. and J.B. Loomis. 1980. "A note on the use of travel cost models with unequal zone populations." Land Economics, 56; pp. 465-470.
    Dealing with regression equations used to estimate travel cost models, this paper contends that a weighting by the square root of population is necessary to correct for heteroskedasticity and thus improve benefit and use estimates.

5.10   Brookshire, D.S. et al.   1982.   "Valuing public goods: a comparison of survey and hedonic approaches." American Economic Review, 72; pp. 165-177.
    Supports the research of Bishop and Heberlein (1979) that estimates from contingent valuation of willingness to pay are conservative rather than exaggerated.

5.11   Brown, W. et al.   1983.   "Using individual observations to estimate recreation demand functions: a caution."   American Journal of Agricultural Economics, 65; pp. 154-157.
    Shows that the use of zone averages, rather than full individual observations., tends to minimize the statistical effects of recall error on coefficient estimates in building travel cost models and contingent valuations.

5.12   Brown, W.G. and F. Nawas.   1972.   "A new approach to the evaluation of non-priced recreational resources: a reply." Land Economics, 48; pp. 403-405.
    Touched off a dispute with Pearse in the literature.

5.13 (x6) Burdge, R.G., J.H. Gramann and J. Buchanan. 1979. The Lake Shelbyville Recreation Study. Urbana, Illinois; Institute for Environmental Research, Research Report 5.
   Presents a theoretical and empirical study of benefits and impacts (developed from county level input-output matrices) derived from recreation at a reservoir in Illinois; compares to predictions in plan prior to construction.

5.14 (x3,6) Burdge, R.J. and R. Ospyszek (eds.). 1980. Coping With Change: An Interdisciplinary Assessment of the Lake Shelbyville Reservoir. Urbana, Illinois; Institute for Environmental Research, Research Report 8.
   Presents recreation benefit results from Burdge, Gramann and Buchanan (1979) in an integrated manner with findings on agricultural and other benefits, and with environmental impacts; discusses water quality relative to recreation (and other factors).

5.15   Burt, O.R. and D. Brewer. 1971. "Estimation of net social benefits from outdoor recreation." Econometrica, 39; pp. 813-827.
   A fairly comprehensive overview of the concepts and empirical problems involved in benefit estimation.

5.16   Canadian Outdoor Recreation Research Committee. 1975. The Economic Impact of Parks. Toronto; ORCOL Publications.
   This volume discusses benefits as well as impacts. Outlines the processes for evaluating primary and secondary benefits; gives examples; gives suggested methodologies; also covers multiplier derivation.

5.17   Caulkins, P.P., R.C. Bishop and N.W. Bouwes. 1985. "Omitted cross-price variable biases in the linear travel cost model: correcting common misconceptions." Land Economics, 6; pp. 482-487.
   Discusses situations where substitute sites must be considered; shows that failure to include a term in a travel cost equation for substitute sites can cause benefit estimates to be overstated.

5.18   Cesario, F.J. 1976. "Value of time in recreation benefit studies." Land Economics, 52; pp. 32-40.
   One of the classic studies of the subject.

5.19   Cesario, F.J. and J.L. Knetsch. 1970. "Time bias in recreation benefit estimation." Water Resource Research, 6; pp. 700-704.

5.20   Cicchetti, C.J., A.C. Fisher and V.K. Smith. 1976. "Economic valuation of a generalized consumer surplus measure: the Mineral King controversy." Econometrica, 44; pp. 1259-1277.
   A frequently cited reference; offers conceptual advances plus a case study.

5.21 (x3) Cicchetti, C.J. and V.K. Smith. 1973. "Congestion, quality deterioration and optimal use: wilderness recreation in the Spanish Peaks Primitive Area." Social Science Research, 2; pp. 15-30.
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5.22   Clark, R.T.   1980. "Input-output and benefit-cost analysis for water resource development projects."   Water Resource Bulletin, 16; pp. 36-40.
    Discusses recreation benefits in context with all types of water project benefits.

5.23   Clawson, J.M. et al. 1971. "The concept of economic surplus and its use in economic analysis." The Economic Journal, 81; pp. 741-791.
    A widely cited work; provides a compendium of the state of the art to the time of writing.

5.24 (x4) Clawson, M. 1959. Methods of Measuring the Demand for and Value of Outdoor Recreation.   Washington; Resources for the Future, Reprint No. 10.
    The "grandfather" classic of the field; introduces the travel cost method for valuing consumer surplus.

5.25   Clawson, M. and J.L. Knetsch.   1966.   Economics of Outdoor Recreation. Baltimore; Johns Hopkins University Press.
    Probably the most cited work in the field.

5.26   Common, M.S. 1973. "A note on the use of the Clawson method for the evaluation of recreation site benefits."   Regional Studies, 7; pp. 401-406.

5.27 (x3) Coomber,   N.H.   and   A.K.   Biswas.   1972.   Evaluation of Environmental Intangibles: A Review of Techniques. Ottawa; Canada Department of the Environment.
    Discusses specific consumer surplus valuation techniques, along with shortcomings and pitfalls.

5.28   Couch, J.D. 1975.   "Recreation with neoclassical economics." G.A. Searle (ed.), Recreation Economics and Analysis. Papers of Symposium on Recreation Economics and Analysis, London Graduate School of Business Studies. Burnt Mill, Essex; Longmans.
    Derives an analytical site demand curve from postulated utility function and population distribution; compares to Clawson; shows bias can arise in estimation of both demand and benefit.

5.29 (x3) Currie, Coopers & Lybrand Ltd., Earl R. Combs Inc. and Larry Smith & Associates Limited.   1982.   The Effects of Acidic Precipitation on Recreation   and Tourism in Ontario. Toronto; prepared for Ontario Ministry of the Environment.
    Good analytical framework for measuring economic costs of impacts of lake acidification on recreation.   Also discusses impacts on recreational experience and user perceptions of fear, regardless of actual physical impacts of the water quality change (in this case lower pH).

5.30   Darling, A.H.   1973.   "Measuring benefits generated by urban water parks." Land Economics, 49; pp. 22-34.
    This work contains suggestions for research as well as results therefrom.

5.31   Davidson, P., F.G. Adams and J.J. Seneca. 1966. "The social value of water·recreational facilities resulting from an improvement in water quality: the Delaware estuary." A.V. Kneese and S.C. Smith (eds.), <u>Water Research.</u> Baltimore; Johns Hopkins University Press.

5.32   Dickerman, A. 1972. "A value-oriented approach to water policy objectives." <u>Land Economics</u>, 48; pp. 398-403.

<u>5.33</u>   Dwyer, J.F., J.R. Kelly and M. Bowes. 1977. "Improved procedures for valuation of the contribution of recreation to national economic development." Urbana, Illinois; Water Resources Center, University of Illinois, Report 128.
    An extensive development and review of the travel cost and contingent valuation approaches; shows both techniques as conceptually valid.

5.34   Elsner, G.H. (ed.). 1977. <u>State of the Art Methods for Research, Planning and Determining the Benefits of Outdoor Recreation.</u> Washington; Forest Service, U.S. Department of Agriculture.

5.35   Fischer, D.W. 1975. "Willingness to pay as a behavioral criterion for environmental decision-making." <u>Journal of Environmental Management</u>, 3.

5.36 (x3) Fisher, A. and J.V. Krutilla. 1972. "Determination of optimal capacity of resource-based recreation facilities." <u>Natural Resources Journal</u>, 12; pp. 417-444.

5.37   Freeman, A.M. 1979. "Recreation benefits." Chapter 8, <u>The Benefits of Environmental Improvement.</u> Baltimore; Johns Hopkins University Press.
    A comprehensive treatment of the issues; shows that the marginal benefits of a change in management can be calculated as the area between the old and new demand curves.

5.38 (x4) Freeman, A.M. and R.V. Haveman. 1977. "Congestion, quality deterioration and heterogeneous tastes." <u>Journal of Public Economics</u>, 8; pp. 225-235.

5.39   Gamble, H.B. 1975. "Regional economic impacts from outdoor recreation." Proceedings, <u>Indicators of Change in the Recreational Environment - A National Research Symposium.</u> University Park, Pennsylvania; Penn State HPER Series 6.

<u>5.40</u>   Gibson, J.G. 1975. "Problems of measuring recreation benefits with dual pricing systems." G.A. Searle (ed.), <u>Recreation Economics and Analysis.</u> Papers of Symposium on Recreation Economics and Analysis, London Graduate School of Business Studies. Burnt Mill, Essex; Longmans.
    Addresses the benefit problem when some resource users pay different fees than others.

5.41   Gramann, J.H.   1983.   "An ex post facto analysis of the regional impact of expenditures for reservoir recreation." Journal of Environmental Management, 16; pp. 357-367.
     A more thorough look at the economic impacts of recreation in the Lake Shelbyville example (Burdge, Gramann and Buchanan 1979; Burdge and Ospyszek 1980); uses expenditure data and input-output analysis.

5.42   Greenley, D.A., R.G. Walsh and R.A. Young.   1982.   Economic Benefits of Improved Water Quality: Public Perceptions of Option and Preservation Values.   Boulder, Colorado; Westview Press, Studies in Water Policy and Management, No. 3.
     Provides examples of contingent valuation willingness to pay (Knetsch method).

5.43   Harrington, W.   1981.   The Distribution of Recreation Benefits from Improved Water Quality.   Washington; unpublished report to National Science Foundation, Resources for the Future.

5.44   Harris, B.S.   1984.   "Contingent valuation of water pollution control." Journal of Environmental Management, 19; pp. 199-208.

5.45 (x6) Hendon, W.S.   1981.   Evaluating Urban Parks and Recreation. New York; Praeger.
     A "how to" guide for comprehensive evaluation of park and recreation services; portions of chapter 6 deal with efficient public choice (Pareto sense);   chapter   7   treats   cost-benefit   studies,   benefits   by Clawson-Knetsch method.

5.46   Hines, T.I.   1974.   Revenue Sources Management in Parks and Recreation. Arlington, Virginia; National Parks and Recreation Association.

5.47   Kalter, R.   1971.   The Economics of Water-Based Outdoor Recreation: A Survey and Critique of Recent Developments. Alexandria, Virginia; U.S. Army Institute for Water Research.

5.48   Kalter, R.J. and W.B. Lord.   1968.   "Measurement of the impact of recreation investments on a local economy." American Journal of Agricultural Economics, May 1968; pp. 248-256.
     One of the first references to use "from-to" analysis to reduce the burden of input-output data requirements in recreational impact calculations.

5.49   Kneese, A.V.   1985.   "Measuring the benefits of environmental preservation or improvement: a commentary on recent research in the United States."   Unpublished. Presented to Economic Council of Canada Colloquium on the Environment, December 9-10, 1985, Toronto.
     Reports on innovative recent work on contingent valuation of water pollution control benefits, including option values, on U.S.-wide basis.

5.50   Kneese, A.V. and S.C. Smith (eds.).   1966.   Water Research. Baltimore; Johns Hopkins University Press.
     A classic in the broad field.

5.51 (x2,3) Knetsch, J.L.   1974.   Outdoor Recreation and Water Resources Policy.   Washington; American Geophysical Union, Water Resource Monograph No. 3.
    Authoritative overview of the field, policy oriented.

5.52   Knetsch, J.L. and R.K. Davis. 1966. "Comparison of methods for recreation evaluation."   Kneese, A.V. and S.C. Smith (eds.), Water Research. Baltimore; Johns Hopkins University Press.   Also in Dorfman, R. and N. Dorfman (eds.), 1972, Economics of the Environment, New York; Norton and Co.
    Compares expenditure, market value and cost methods; willingness to pay by interview and imputation from travel costs.

5.53   Knetsch, J.L., R. Brown and W. Hansen.   1976. "Estimating expected use and value of recreation sites." C. Gearing, W. Swart and T. Var (eds.), Planning for Tourism Development. New York; Praeger & Co.
    An early comprehensive treatment of the subject; introduced the use of a variable in the travel cost method to reflect substitute recreation opportunities, including price, quality, and availability of substitutes.

5.54   Knetsch, J.L. and P.H. Freeman.   1979.   "Environmental and economic assessments in development project planning."   Journal of Environmental Management, 9; pp. 237-246.

5.55   Krutilla, J.V. and C.J. Cicchetti. 1972. "Evaluating benefits of environmental resources with special application to the Hells Canyon." Natural Resources Journal, 12; pp. 1-29.

5.56   Maler, K.   1974.   Environmental Economics. Baltimore; Johns Hopkins University Press.
    Deals with basic issues in recreation benefits; comprehensive textbook.

5.57   Mansfield, N. 1971. "The estimation of benefits from recreation sites and the provision of a new recreation facility." Regional Studies, 5; pp. 55-69.

5.58 (x3) McConnell, K. 1977. "Congestion and willingness to pay: a study of beach use." Land Economics, 53; pp. 185-195.

5.59 (x3) McConnell, K.   1980.   "Comment: valuing congested sites." Journal of Environmental Management, 7; pp. 389-394.
    Disagrees with Wetzel (1977) that accounting for congestion always causes higher consumer surplus than standard Clawson method.

5.60   McConnell, K.E. and V. Duff. 1976. "Estimating net benefits of recreation under conditions of excess demand."   Journal of Environmental Economics and Management, 2; pp. 24-30.

5.61   Mendelsohn, R. and G.M. Brown.   1983.   "Revealed preference approaches to valuing outdoor recreation." Natural Resource Journal, 21; pp. 607-618.
     Shows that, from household production theory, observed behaviour of visitation traces out an efficient recreation use frontier. Thus, sites not actually visited are not cost-effective substitutes.

5.62   Meyer, P.A.   1975.   A Comparison of Direct Questioning Methods for Obtaining Dollar Values for Public Recreation and Preservation. Vancouver; Canada Department of the Environment.
     A key discussion of several contingent valuation tactics.

5.63   Mishan, E.J.   1975.   "Welfare validity of the demand for recreation."   G.A. Searle (ed.), Recreation Economics and Analysis. Papers of Symposium on Recreation Economics and Analysis, London Graduate School of Business Studies. Burnt Mill, Essex; Longmans.

5.64   Ontario Ministry of the Environment.   Policy and Planning Branch.   1985.   Socio-Economic Considerations Applying to a Microbiological Standard for Recreational Waters. Unpublished. Toronto.
     An interesting attempt to set values for decision making purposes on alternative standards considered in Ontario Ministry of the Environment, Hazardous Contaminants and Standards Branch 1984.

5.65   O'Riordan, J.   1975.   "Evaluation Procedures."   Canada, Department of the Environment, Monograph on Comprehensive River Basin Planning. Ottawa.

5.66   Pearse, P.   1968.   "A new approach to the evaluation of non-priced recreational resources." Land Economics, 44; pp. 87-99.
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5.68   Randall, A., B.C. Ives and C. Eastman.   1974.   "Bidding games for valuation of aesthetic environmental improvements." Journal of Environmental Economics and Management, 1; pp. 132-149.

5.69   Ross, Don.   1980.   Recreational Benefits and Costs: A Review, A Practical Method of Estimating Benefits, and a Site-Specific Application. Toronto;   Policy Coordination Secretariat, Ontario Ministry of Natural Resources.
     Practical test of estimating economic benefits of Lake Erie beaches in Essex County, using Ontario Recreation Survey and other data.

5.70   Russell, C.S. and W.J. Vaughan. 1982. "The national recreational fishing benefits of water pollution control." Journal of Environmental Economics and Management, 9; pp. 328-354.

5.71 (x4)   Searle, G.A. (ed.). 1975. Recreation Economics and Analysis. Papers of Symposium on Recreation Economics and Analysis, London Graduate School of Business Studies. Burnt Mill, Essex; Longmans; 1975.
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5.73   Shabman, A. 1972. Decision Making in Water Resource Investment and the Potential of Multi-Objective Planning: The Case of the Army Corps of Engineers. Ithaca, New York; Cornell University Water Resources Center, Technical Report 42.

5.74 (x2)   Sinclair, W.F. 1974. The Socio-Economic Importance of Maintaining the Quality of Recreational Resources in Northern British Columbia: The Case of Lakelse Lake. Vancouver; Fisheries and Marine Service, Canada Department of Fisheries and Oceans; PAC/T-74-10.
    Uses the travel cost method along with spending and job creation estimates to arrive at regional benefits from salmonid enhancement and other water-based recreational supply improvements.

5.75   Smith, K. and R. Kopp. 1980. "The spatial limits of the travel cost recreational demand model." Land Economics, 56; pp. 64-72.
    Confirms procedure first used by Wennergren (1967) that the highest observed distance should be used as the upper limit in a travel cost method analysis.

5.76   Smith, R.J. 1975. "Problems of interpreting recreation benefits from a recreation demand curve." G.A. Searle (ed.), Recreation Economics and Analysis. Papers of Symposium on Recreation Economics and Analysis, London Graduate School of Business Studies. Burnt Mill, Essex; Longmans.

5.77   Smith, V.K. 1981. "Congestion, travel cost recreation demand models and benefit evaluation." Journal of Environmental Economics and Management, 8; pp. 92-96.

5.78   Sorg, C. et al. 1985. The Net Economic Value of Cold and Warm Water Fishing in Idaho. Fort Collins, Colorado; Rocky Mountain Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture; Resource Bulletin RM-11.
    A recent study drawing together the latest concepts and techniques. Showed that contingent valuation estimates were less than half of travel cost estimates; willingness to pay was greater for increased catch or fish size.

5.79   Stevens, J.B. 1966. "Recreation benefits from water pollution control." Water Resources Research, 2; pp. 167-182.

5.80   Strong, E.   1983. "A note on the functional form of travel cost models with unequal populations." Land Economics, 59; pp. 342-349.
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5.83   U.S. Water Resources Council. 1979. Procedures for Evaluation of National Economic Development (NED) Benefits and Costs in Water Resources Planning Level C. Washington, D.C.; Federal Register; December 14, 44(243); pp. 72892-72976.
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5.84   U.S. Water Resources Council. 1983. Economic and Environmental Principles for Water and Related Land Resources Implementation Studies. Washington, D.C.; U.S. Government Printing Office.
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    Deals with the issue of valuing a recreational day versus a recreational experience or use; gives empirical values for angling.

5.86   Vickerman, R.W.   1975.   The Economics of Leisure and Recreation. New York; Macmillan.

5.87   Walsh, R.   1983.   Recreation Economics Decisions. Fort Collins, Colorado; Citizen's Printing Co.
    Comprehensive discussion and development; covers contingent valuation and travel cost methods.

5.88   Wennergren, E.B. 1967. Demand Estimates and Resource Values for
Resident Deer Hunting in Utah. Logan, Utah; Agricultural Experiment Station,
U.S. Department of Agriculture; Bulletin 469.
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     method and explores its spatial limits.

5.89   Wennergren, E.B. and W.E. Johnson. 1977. "Economic concepts
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Recreation - Advances in Applications of Economics.   Washington; Forest
Service, U.S. Department of Agriculture; General Technical Report WO-2.

5.90   Wetzel, J.N. 1977. "Estimating the benefits of recreation under
conditions of congestion."   Journal of Environmental Economics and
Management, 4; pp. 239-246.
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     calculated by Clawson travel cost method; started controversy in
     literature with disagreeing researchers.

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     if commodity being valued is a small portion of respondent's budget.

5.92   Wilman, E.A.   1980.   "The value of time in recreation benefit
studies." Journal of Environmental Economics and Management, 7; pp. 272-286.
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     measurement methods and questionnnaire used.

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benefit." Leisure Sciences, 5; pp. 381-396.
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     in Illinois; considers accessibility and attraction of sites as
     "correction" to travel cost method; discusses the efficiency of provision
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5.94   Ziemer, R.F., W.N. Musser and R.C. Hill. 1980. "Recreation
demand equations; functional form and consumer surplus." American Journal of
Agricultural Economics, 62; pp. 136-141.
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6. Field Data Collection Methods

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stay from sample interviews." Journal of Forestry, 61; pp. 912-914.

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interval count samplings: two new techniques for estimating recreation use."
Forest Science, 21; pp. 40-44.

6.3   Tyre, G.L. and C.D. Siderelis. 1979. "Instant count sampling: a technique for estimating recreation use in municipal settings." Leisure Sciences, 2; pp. 173-179.
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7. Microcomputer Database and Modelling Techniques

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7.4   Cesario, F.J. 1975. "A combined trip generation and trip distribution model." Transportation Science, 9; pp. 211-223

7.5   Cheung, H.K. 1972. "A day-use visitation model." Journal of Leisure Research, 4; pp. 139-156.

7.6   Coppock, J.T. and B.S. Duffield. 1975. Recreation in the Countryside: A Spatial Analysis. London; Macmillan.

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7.8   Ewing, G.O. 1980. "Recreational trip generation and distribution models." Leisure Sciences, 3; pp. 1-24.

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7.10   McAllister, D.M. and F.R. Klett. 1976. "A modified gravity model of regional recreation activity with an application to ski trips." Journal of Leisure Research, 8; pp. 21-34.

7.11   Vickerman, R.W. 1974. "Accessibilty, attraction and potential: a review of some concepts and their use in determining mobility." Environment and Planning A, 6; pp. 675-691.

7.12   Wennergren, E.B. and D.B. Neilsen. 1970. "Probability estimates of recreation demands." Journal of Leisure Research, 2; pp. 112-122.

7.13   Wilson, A.G.   1974.   "A family of spatial interaction models." Environment and Planning, 3; pp. 1-32.

8. Biophysical Determinants of Beach Use

8.1   Canada Department of Regional Economic Expansion. 1969. Land Capability Classification for Outdoor Recreation.   Canada Land Inventory Report No. 6. Ottawa.
    Outlines the factors used in beach capability assessment for contact and noncontact activities for the Canada Land Inventory.

8.2   Crowe, R.B., G.A. McKay and W.M. Baker. 1977. The Tourist and Outdoor Recreation Climate of Ontario.   3 vols.   Toronto; Atmospheric Environment Service, Canada Department of Fisheries and the Environment.
    The standard work on climatic limitations to recreation in Ontario.

8.3   [Ontario Department of Lands and Forests.] 1971. Methodology for Ontario Recreation Land Inventory. [Toronto.]
    Outlines the factors used in shoreland capability assessment for bathing in the Ontario Land Inventory.

8.4 (x2)   Ontario Provincial Secretariat for Resources Development. Tourism and Outdoor Recreation Planning Study Committee. 1975. Ontario Recreation Supply Inventory Users Manual. Toronto.
    Outlines the factors used in determining the supply provided by swimming beaches for the Ontario Recreation Supply Inventory.

8.5   Regional Municipality of York. 1975. A Study to Determine the Potential for Swimming and Angling in the Kettle Lakes of York Region. Newmarket, Ontario.
    Identifies water volume limiting factor for heavily used small lakes, based on dilution necessary to maintain bacterial contamination at acceptable levels.

9. Water Quality Criteria for Recreation

9.1   Canada Department of the Environment. Inland Waters Branch. Guidelines for Water Quality Objectives and Standards: A Preliminary Report. Technical Bulletin No. 67. Ottawa.

9.2   Canada   Department   of   National   Health   and   Welfare.
Federal-Provincial Working Group on Recreational Water Quality.   1983.
Guidelines for Canadian Recreational Water Quality.   Ottawa.
     While these criteria are not binding, they represent a very up to date
     and comprehensive discussion of biological factors affecting contact
     recreation in the Canadian environment.   A thorough bibliography of
     biological factors is included.

9.3   Gore & Storrie Limited.   1985.   Eastern Beaches Studv 1984.
Toronto; prepared for City of Toronto, Department of Public Works.
     This study of Toronto's Eastern Beaches is one of the most comprehensive
     yet done in Ontario.   Widespread and frequent sampling combined with
     modelling showed complex variations in coliform contamination patterns,
     often varying dramatically in short periods of time and short distances.

9.4   Hewings, John M. 1968. Water Quality and the Hazard to Health:
Placarding Public Beaches.   Toronto; University of Toronto, Department of
Geography, Natural Hazard Working Paper No. 3.
     Dated   but   interesting   discussion   of water quality criteria for
     recreation, and their application in Ontario by medical officers of
     health.   Argues that there is little relationship between criteria and
     placarding, and effective minimization of risks.

9.5   Ibbotson, B. and B.J. Adams. 1977. "Formulation and testing of
a new water quality index." Proceedings of the 12th Canadian Symposium on
Water Pollution Research.   Toronto.

9.6   Ontario Ministry of the Environment. Hazardous Contaminants and
Standards Branch.   1984. Scientific Criteria for Microbiological Standards
for Recreational Waters. Unpublished draft. Toronto.
     This report reviews existing Ontario standards for recreational water
     quality and discusses criteria for new standards on the basis of up to
     date literature and analytical procedures.   However, the work remains
     incomplete and the draft report confidential.

9.7   Ontario Ministry of the Environment. 1984. Water Management:
Goals, Policies, Objectives and Implementation Procedures of the Ministrv of
the Environment. Toronto.
     Includes Ontario water quality objectives for swimming and bathing use of
     water.

9.8   Ontario Ministry of Health. 1975. "Water quality guidelines for
bathing beaches." Toronto.

9.9*   Palmer, M.D., J.D. Lock and T.P.H. Gowda. 1984. "The use of
bacteriological indicators for swimming water quality." Canadian Water and
Pollution Control, 122; p. 14.

9.10   U.S. Department of the Interior. Federal Water Pollution Control Administration. 1968. Water Quality Criteria: Report of the National Technical Advisory Committee to the Secretary of the Interior. Washington.
    A comprehensive discussion of standards for primary (contact) and secondary (noncontact) recreation.

9.11   Walski, Thomas M. and Frank L. Parker. 1974. "Consumers water quality index." Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, 100, EE; pp. 593-611.
    An interesting concept for a water quality index based primarily on recreational considerations, with discussion of significant factors.

9.12   World Health Organization. Regional Office for Europe. 1975. Guides and Criteria for Recreational Quality of Beaches and Coastal Waters. Copenhagen.

Anthony Usher Planning Consultant

Notes on Workshop/Project J6-01
April 17, 1986

Ministry of the Environment, Etobicoke

Present: Dr. Merv Palmer, Gore & Storrie Limited
          Dr. Reid Kreutzwiser, Department of Geography, University of Guelph
          Dr. Geoff Wall, Department of Geography, University of Waterloo
          Mr. Carl Griffith*, Corporate Policy and Planning, Ministry of the
             Environment
          Dr. Jack Donnan*, Corporate Policy and Planning, Ministry of the
             Environment
          Ms. Michèle Dandelé, Corporate Policy and Planning, Ministry of the
             Environment
          Mr. Wan Wong, Water and Wastewater Management Section, Water
             Resources Branch, Ministry of the Environment
          Mr. Dennis Onn*, Aquatic Ecosystems Section, Water Resources
             Branch, Ministry of the Environment
          Mr. Brian McGowan, DPA Group Inc.
          Ms. Sofia Lukovich, DPA Group Inc.
          Mr. Tony Usher, Anthony Usher Planning Consultant
          Dr. Jack Ellis, Jack B. Ellis and Associates Limited
          Mr. Michael Michalski, Michael Michalski Associates
          (* - present for part only)

Beach Use and Environmental Quality in Ontario

1. Mr. Usher noted the presence of Mr. McGowan and Ms. Lukovich of DPA Group
    Inc. Their firm is currently undertaking a parallel study of changes in
    recreational use and value arising from lake reclamation in Ontario for
    Corporate Policy and Planning, which had invited them to attend.

2. Dr. Donnan briefly outlined the Ministry of the Environment's objectives
    for the study.   Ministry decision makers are currently faced with
    questions as basic as, what is a beach? The study products should aid
    the Ministry in setting priorities for initiatives within the Beach
    Management Program, for which $20 million was allocated in 1985-86 and a
    comparable amount will be committed this fiscal year. Mr. Wong noted
    that Water Resources has already identified St. Catharines and
    Peterborough as interim priorities for studies of pollution sources and
    remedies, leading to cost effective pollution control plans. A three
    year study of the St. Catharines beaches has begun, and a program for
    Peterborough is under consideration. Mr. Onn, who is involved with the
    Ministry's Inland Lakes Management Program, which is intended to address
    contamination, eutrophication, and acidification of economically and
    socially significant inland waters, noted that the beach use and
    environmental quality study will provide information useful in setting
    priorities for this program as well.   Both the Beach Management and

Inland Lakes Management programs are primarily environmental management rather than research programs, and are directed mainly at bringing about water quality improvements in known problem areas using known methods.

3. Mr. Usher spoke to the study team's perceptions of the end products that the Ministry needs. It was evident from discussions with various Ministry staff that use levels and economic benefits (to the extent that these are influenced by water quality) are seen as the key criteria in setting priorities among beaches. Accordingly, the consultants had identified three end products:
   - the identification of public beaches which sustain significant use and generate significant welfare and local economic impact benefits; this needs to be done in two stages, first, those beaches which have some threshold level of significance (master beach list), and second, the levels of significance of beaches within the master beach list;
   - the identification of the significance of controllable or alterable aspects of water quality in determining beach use and benefits in Ontario;
   - a basis for determining what kinds of changes in use and benefits can be expected at specific beaches given specific changes in water quality at those beaches.

   In its proposal, the study team had envisioned three relatively separate products: a master beach list, a model, and some work on valuation. In addition, work on field data collection methods was proposed. The team now sees the three former products as very much integrated into a single data base, usable and manipulable for decision making. The team will still be considering field data collection methods, but this aspect does not have the priority for the summer of 1986 which was suggested in the proposal.

4. Mr. Usher indicated what the study team was hoping for from today's workshop: a consensus on the significant parameters affecting beach use in Ontario and why they are significant, a consensus on an approach to modelling beach use-environmental quality relationships, and a consensus on the types of economic values which should be taken into account.

5. Mr. Usher reviewed the state of the information base on beach sites in Ontario. The principal sources will be the Ontario Recreation Supply Inventory, Ministry of Natural Resources information on provincial park beaches, weekly summaries of postings compiled by the Ministry of the Environment in 1984 and 1985, and, subject to negotiation with the Ministry of Health, local health unit lists of locations sampled (many of these may not qualify as beaches under any reasonable definition). Drs. Wall and Kreutzwiser noted that the Canada and Ontario Land Inventories could provide additional sources of information. The CLI information is computerized, and digitized maps of (for example) all Class 1 and 2 beach locations in Ontario could be obtained, although the cost may be high. The team could use this type of information as part of the screening process by requiring beaches to be of certain capability classes. Dr. Palmer noted that beach use characteristics are dynamic, and that as a result recreational capability assessments can be outdated. For example,

windsurfing and water slides were not anticipated in the capability assessments of the 1960s and·1970s, and do not require the same physical characteristics as more traditional uses.

6. Mr. Usher reviewed the information base on beach use in Ontario. The principal sources will be the Ontario Recreation Survey for overall patterns, the Ministry of Natural Resources for use patterns at provincial park beaches, and that Ministry and conservation authorities for attendance data at fee sites (to the extent required for confirmation purposes). Use data at free municipal sites appear to be almost nonexistent. The City of Toronto, for example, has no use data. The City of Ottawa may have some information. The surveys of use at Little Lake, Peterborough, in 1985 may be the most comprehensive available, but deal with a relatively small and uncomplicated site. Dr. Palmer noted that it is almost impossible to do field observation head counts at heavily used beach sites, especially on numbers in the water. Information on garbage pickup volumes, if available, may provide good indications of use. Dr. Wall questioned the value of a major effort to collect data on onsite numbers of users. Considerable information is already available on how total seasonal use is distributed over the relatively short time period available for beach recreation. Dr. Kreutzwiser noted that low level air photography can be a very efficient method of identifying use levels; the instantaneous head counts can be integrated with general knowledge of user distribution. This was done at Pinery Provincial Park in the early 1970s. Dr. Palmer noted that the Ministry of the Environment's Skywatch program, under which volunteer flyers trace spills etc., could be used for this purpose.

7. The consultants asked for comments and suggestions on Literature Identification and Review, previously distributed. They also noted the lack of literature on the relationship between lake level fluctuations and beach use. Dr. Wall noted that Roger Needham had done M.A. and Ph.D. theses at the University of Ottawa on content analysis of media discussion of fluctuating lake levels, lake hazards, and use impacts. Depending on the way his data are sorted, some anecdotal information on relationships may be available. Dr. Kreutzwiser noted that it would be very simple to correlate annual Great Lake levels with attendance and user survey data at beach oriented provincial parks. The expert panelists will advise the consultants of any additional literature suggestions they can think of.

8. Preliminary Notes on Definitions and Assumptions, previously circulated, was discussed briefly. Regarding the jurisdictional scope of beaches to be included in the study, Dr. Kreutzwiser felt that larger beaches at resorts etc. should be included, inasmuch as they are accessible to members of the general public who choose to be guests of these establishments. The expert panelists will provide the consultants with any additional comments they may have on this material.

9. Dr. Ellis outlined the study team's preliminary thoughts regarding modelling the determinants of beach use. He noted that the data

available in the Ontario Recreation Survey can be used for this purpose, using "natural" swimming (which can be separated from pool swimming) as a surrogate for beach recreation in general. However, it will still be necessary to distinguish between contact and noncontact recreation, as noted in Preliminary Notes on Definitions and Assumptions, and establish a relationship between swimming and other uses. The ORS data also permit a distinction between home-based and non-home-based participation, which is essential. The use of these data is also facilitated by the fact that swimming participation in Ontario appears to be relatively homogeneous among regions and among demographic groups (age groups excepted). The data can be used to generate an origin-destination matrix of beach swimming occasions for major regions of the province, with destination use distributed on a gravity basis. Once the key determinants of beach use have been identified, and those which are quantifiable or classifiable for individual sites have been specified, algorithms can be developed to indicate the relationship of each determinant on a beach's capacity and attraction power. These factors in turn will determine, on a gravity basis, the allocation of destination use in a region among the individual beach destinations in that region. As a result, detailed regional models can be developed to estimate attendance and use at individual sites, and estimates for certain fee sites can be tested against attendance data. Each regional model will therefore include the master beach list for that region, and the quantifiable/classifiable parameters identified as having a significant impact on beach use. The Ministry of the Environment has specified that the model and data base must be IBM PC compatible. The proposed models can be implemented with conventional spreadsheet software.

Dr. Kreutzwiser indicated that beach use is a package, which includes an expectation or desire for some form of participation in contact activity as well as participation in noncontact activity. It is essential to identify for valuation purposes what is the primary motivation of a trip to the beach, and it is questionable to try to distinguish between contact and noncontact activity. Mr. Usher noted that in settings where a beach is part of the urban fabric (for example, Toronto's eastern and western beaches), much use does not involve any expectation of or interest in contact recreation. Dr. Kreutzwiser noted that the extent to which this is true depends on where one draws the line between the true beach and the urban fabric behind it (from the point of view of this study, is all the parkland behind the western and eastern beaches part of those beaches?). Dr. Kreutzwiser made the more general comment that use could be overemphasized in priority setting and therefore in model outputs. Actual use is very much subject to fluctuating tastes, misconceptions, etc. Perhaps what is more important from a public policy point of view are the inherent characteristics of beaches which determine what use "should" be in a rational world: accessibility, capacity, environmental quality, etc. Accessibility may be a quite acceptable surrogate for use in a priority classification system.

Dr. Wall expressed concern about the complexity of the model, especially given the almost complete absence of reliable use data and the

approximate nature of any economic values which may be extrapolated from use estimates. If the model and data base are going to be more than one shot exercises which will continue to be useful to the Ministry of the Environment, they should be kept simple. The consultants have indicated that there could be in the order of several hundred to over a thousand beaches on the master list. Could this number not be cut down significantly? Very simple thresholds could be established to sort out the beaches that are important on the basis of size, location/ accessibility, and use volumes. Then the most important beaches could be dealt with in a more complex model of the type described. Mr. Usher pointed out that there might be some concern from the Ministry about cutting out too many beaches too brusquely, because of the desire to ensure that all areas of the province are taken into account, recorded in the information base, etc. Dr. Palmer agreed that because of the fuzziness of so many of the factors involved in beach use, the model should be as simple as possible. Dr. Kreutzwiser cautioned against oversimplification or discarding too many beaches. There are many important beaches in the province which do not now have water quality problems which deter use, but may not be too far away from having them. However, he agreed that a good set of apolitical initial screening parameters is essential. Dr. Palmer noted that the type of water quality problems to which Dr. Kreutzwiser was referring would not include bacterial contamination, as contamination in itself does not affect use within ranges normally found in Ontario.

Panelists also noted that as water quality standards are subject to change over time, and as there could be specific changes in the not too distant future, the study team should ensure that the model is flexible enough to accommodate any such changes.

10. The study team's Determinants of Beach Use, previously circulated, was briefly reviewed. The consultants pointed out that nuisance birds (gulls, geese, etc.) should be added to the list of aquatic determinants. Dr. Wall noted that incompatible recreational activities (boating etc.) should be added to the development and management determinants. Dr. Palmer noted that there is a growing tendency towards de facto separation of windsurfing and swimming; for example, on the eastern waterfront of Toronto, swimmers congregate at Woodbine Beach while windsurfers tend to use the Outer Harbour. Dr. Wall noted that in inland lakes, there tends to be some de facto separation of activities on both spatial (physical suitability) and temporal (time of day) bases.

A Determinants Worksheet was circulated, to allow participants to indicate their opinions of the strength of effect of each determinant on beach use in Ontario. The expert panelists and Mr. Wong, on behalf of Water and Wastewater Management, were asked to return completed worksheets to the consultants; other participants are free to do so if they wish. The question was raised as to whether responses to the worksheet should take into account the fact that many user responses are based on news, rumour, etc. before users ever (or never) get to the beach. While the consultants had noted on the list of determinants that

secondhand perception is an important part of responses to contamination by bacteria, pathogens, and toxins, they agreed that this can also be the case with other aquatic determinants as well as some of the nonaquatic determinants (e.g., rowdyism and other aspects of management character and intensity). It was agreed that respondents should fill out the worksheet on the basis of all aspects of user behaviour, including secondhand as well as firsthand perceptions, whether or not logical or rational. The study team also clarified that respondents should complete the worksheet on the basis of their perceptions of general public behaviour independent of any personal preferences they may have.

Completed worksheets were subsequently returned by Drs. Kreutzwiser and Wall and Mr. Wong. A worksheet indicating the consensus of these three responses is attached to these notes.

11. Dr. Palmer briefly described Gore & Storrie's recent work on the Eastern Beaches for the City of Toronto, outlining some of the problems encountered with conventional bacterial contamination sampling guidelines, procedures, and interpretations. While the sampling design developed by Gore & Storrie was able to overcome many of these problems, most sampling in Ontario is much less comprehensive and much less statistically valid in light of the extreme spatial and temporal variations in contamination which can occur as a result of rainfall, currents, sampling location and protocol, time of day, etc., plus the variance surrounding laboratory data. The data available for Ontario do not prove any statistically significant cause and effect relationships between fecal coliform bacteria densities and illness, although there does appear to be a confirmed relationship between the pathogen Pseudomonas aeruginosa and swimmer's ear, throat, and eye infections. In any case, many of the conventional solutions are of dubious effectiveness; for example, regardless of incomplete separation between storm and sanitary sewers, gross storm sewer discharges from a given area generally contribute more bacteria than gross untreated sanitary sewer discharges because stormwater volumes are so much greater. Dr. Palmer also noted that in 1985, the Toronto Public Health Department posted Woodbine Beach with signs indicating that swimming would be hazardous within 24 hours following rainfall, while the other beaches were posted on the basis of actual sample results. Beaches in the Ottawa area are posted as a health risk for 24 hours after a rainfall greater than 10 mm and 48 hours after a rainfall greater than 20 mm.

Mr. Onn challenged Dr. Palmer's assertion that, because current sampling practice does not appropriately consider the dynamics of fecal coliform densities at large lake beaches, it would likely not be harmful to swim at those beaches where the geometric mean of 10 daily samples exceeds 100 fecal coliforms per 100 mL. Dr. Wall asked whether in this case, as with other environmental standards, the burden of proof should be on those affected; should not public policy be that recreational waters should be as uncontaminated as possible, without having to have definitive proof of detrimental effects before acting? Dr. Palmer replied that water quality management   should   focus   on

determinants with a demonstrable cause and effect relationship on recreational use and enjoyment. Risk assessment is important, but is difficult to communicate to the public. Beaches need to be sorted and priorities set on the basis of real problems, provided that there are sufficient data to define the problems (which may not be the case). Perhaps there should be different water quality objectives for different parts of the province, with more stringent standards for Wasaga Beach than for Toronto, for example. Apparently the Ministry of the Environment has considered this possibility. The Ministry's internal study of new microbiological standards (E. coli, Pseudomonas aeruginosa) was discussed. It was agreed that the Ministry's apparent intent to make this' work public and attempt to involve the public in risk assessment and standard setting would be desirable.

12. Mr. Usher raised a number of questions regarding the economic benefits of beach use.
    - What is the proper geographical frame of reference for economic impact benefits in this study? Should the shuffling of expenditures from one Ontario site to another be taken into account?
    - Should user welfare be valued? If so, on what basis?
    - Should there be distinctions among benefits on the basis of contact vs. noncontact, home-based vs. non-home-based, etc.?
He also briefly reviewed work done by Corporate Policy and Planning to evaluate the economic tradeoffs between benefits (increased recreational use) and costs (increased disease incidence) of various E. coli standards, based on contamination level-closure frequency and contamination level-illness incidence relationships put forward in the Ministry's assessment of new microbiological standards.

Dr. Wall emphasized the importance of distinguishing between economic impact (flows) and economic value (imputed values). If the study team is interested, Dr. Wall has a simple economic impact model developed for national parks which can be used to estimate flows to regions and sites. Dr. Ellis indicated reservations about using both impact and value as defined by Dr. Wall; one or the other should be used as indicators of benefits. Mr. Usher noted that Mr. Griffith (then absent) had suggested that the consultants consider losses in welfare arising from beach closings, to those users who would not go to another beach and to those who would but would have to accept a second choice site. The question remains of how to value those welfare losses, however.

Dr. Kreutzwiser questioned the appropriateness of a conventional valuation approach in this study. Economic measures are not required to show that beach x is more important than beach y. If welfare measures are required, it is easy to generate willingness to pay per user day values, for example, from the literature. But how meaningful are those measures, and how would they be used and misused by the civil service and political decision makers? If the benefits are incorporated into a benefit-cost framework, what costs will they be measured against? Possible approaches to proxy valuation could include:
    - the consumer surplus/willingness to pay per unit of recreation

approach, which will be accepted because it is conventional;
- developing an indicator of the dependence of a local community on a beach on the basis of obvious factors such as community size, availability of alternative opportunities, beach characteristics, etc.;
- developing an indicator of the inconvenience or welfare loss inherent in closure, primarily on the basis of beach location relative to population.

Dr. Kreutzwiser also suggested that, if dollar values are used and beaches are classified into several orders of inherent significance based on location, capability/quality, etc., a hierarchy of values per unit of recreation could be developed with the highest values being attached to recreation at the most significant beaches. He also indicated that he is more comfortable with valuation of occasions on the basis of travel cost than willingness to pay, because travel cost data at least signify a real commitment to participation and expenditure of time etc. rather than a hypothetical response. However, travel cost admittedly would not work very well in urban situations such as the Toronto beaches.

Dr. Wall noted that, if the mix of users in specific regions or at specific sites can be identified, it would be possible to distinguish between Ontario residents and visitors. In terms of economic impact, only nonresidents contribute significant net benefits to the province. He asked whether anyone has ever attempted to regress beach use against determinants. Dr. Palmer noted that this has not been possible given the almost universal absence of beach use data. However, he noted that the research of Dr. Pat Seyfried of the University of Toronto on contamination-illness relationships in Ontario contains significant data on use levels and other parameters, although these relationships were not the focus of the investigation and were accordingly not evaluated. However, Dr. Seyfried's data may merit analysis.

13. Mr. Usher concluded the workshop by noting that, while a consensus had not been reached on all the points in item 4, the consultants would modify their thoughts on modelling and economic valuation on the basis of the comments received today, and would attempt to develop a consensus regarding parameters on the basis of the worksheets to be received. In addition to the comments mentioned above which the study team is seeking from the panelists, the consultants encouraged the panelists to provide leads to any studies with hard information on beach use, cautionary notes which the consultants should keep in mind as they proceed with the study, and comments on what else the Ministry of the Environment should be doing to meet its beach management planning and priority setting needs.

AU/

BEACH USE AND ENVIRONMENTAL QUALITY IN ONTARIO
Determinants Worksheet

Consensus of completed worksheets, April 17/86 workshop (R. Kreutzwiser, G. Wall, W. Wong)
The circled value is the median and the lined values are the range.

Please indicate, for each of four effects for each determinant, the degree to which you believe the determinant generally affects beach use in Ontario. Please consider the strength of each determinant relative to other determinants.
N = no discernible effect; 1 to 5 = some effect, with 1 = very weak and 5 = very strong.

	effect on homebased contact?	effect on nonhomebased contact?	effect on homebased noncontact?	effect on nonhomebased noncontact?	comments
A q u a t i c					
Colour	N 1 2 3 (4) 5	N 1 2 3 (4) 5	N 1 (2) 3 4 5	N 1 2 (3) 4 5	Important at extreme (2 responses)
Taste	N 1 2 (3) 4 5	N 1 (2) 3 4 5	N 1 (2) 3 4 5	(N) 1 2 3 4 5	Important at extreme (1 response)
Odour	N 1 2 3 (4) 5	N 1 2 3 (4) 5	N 1 2 (3) 4 5	N 1 2 (3) 4 5	Important at extreme (1 response)
Turbidity/clarity	N 1 2 (3) (4) 5	N 1 2 (3) 4 5	N (1) 2 3 4 5	N 1 (2) 3 4 5	Important at extreme (1 response)
pH	(N) 1 2 3 4 5	N 1 2 (3) 4 5	N 1 (2) 3 4 5	(N) 1 2 3 4 5	1 respondent incorporated effects on angling
Indicators of bacterial contamination	N 1 2 3 (4) 5	N 1 2 3 (4) 5	N 1 (2) 3 4 5	N 1 2 (3) 4 5	
Pathogens	N 1 (2) 3 4 5	N 1 (2) 3 4 5	N (1) 2 3 4 5	(N) 1 2 3 4 5	will not arise if people keep away due to bacterial contamination
Toxins	N 1 (2) 3 4 5	N 1 (2) 3 4 5	N 1 2 (3) 4 5	(N) 1 2 3 4 5	
Filamentous algae	N 1 2 (3) 4 5	N 1 (2) 3 4 5	N 1 (2) 3 4 5	N 1 (2) 3 4 5	
Blue green algae	N 1 2 3 (4) 5	N 1 (2) 3 4 5	N 1 (2) 3 4 5	N 1 (2) 3 4 5	
Odour algae	N 1 2 3 (4) 5	N 1 (2) 3 4 5	N 1 (2) 3 4 5	N 1 2 (3) 4 5	
Weeds	N 1 2 (3) 4 5	N 1 2 3 (4) 5	N 1 (2) 3 4 5	N 1 2 (3) 4 5	
Oil/grease/scum	N 1 2 (3) 4 5	N 1 2 3 (4) 5	N 1 (2) 3 4 5	N 1 (2) 3 4 5	
Floating/beached objects	N 1 2 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	2 responses only - will vary with type of objects (2)
Insects/parasites	N 1 2 (3) 4 5	N 1 2 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	2 responses only - will vary with species and quantities (2)
Nuisance birds	N 1 (2) 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	2 responses for contact, 1 for noncontact

Terrestrial

	effect on homebased contact?	effect on nonhomebased contact?	effect on homebased noncontact?	effect on nonhomebased noncontact?	comments
Lake size	N 1 (2) 3 4 5	N 1 (2) 3 4 5	N 1 2 (3) 4 5	N 1 2 (3) 4 5	appears different interpretations placed on this
Beach length	N 1 (2) 3 4 5	N 1 2 (3) 4 5	N 1 2 (3) 4 5	N 1 2 (3) 4 5	appears that these may have been interpreted
Wet beach width/slope	N 1 2 (3) 4 5	N 1 2 3 (4) 5	N 1 2 (3) 4 5	N 1 2 (3) 4 5	variously as affecting quantitative capacity
Dry beach width	N 1 2 (3) 4 5	N 1 2 3 (4) 5	N 1 2 (3) 4 5	N 1 2 (3) 4 5	(assuming a fixed density of use, all other
Beach composition	N 1 2 (3) 4 5	N 1 2 3 (4) 5	N 1 2 (3) 4 5	N 1 2 (3) 4 5	determinants being equal) and qualitative
Backshore conditions	N (1) 2 3 4 5	N 1 (2) 3 4 5	N 1 (2) 3 4 5	N 1 (2) 3 4 5	character (i.e., affecting density of use)
Exposure	N 1 (2) 3 4 5	N 1 2 (3) 4 5	N 1 2 (3) 4 5	N 1 2 (3) 4 5	
Current/undertow	N 1 2 3 (4) 5	N (1) 2 3 4 5	N 1 2 (3) 4 5	N (1) 2 3 4 5	

Climate

	effect on homebased contact?	effect on nonhomebased contact?	effect on homebased noncontact?	effect on nonhomebased noncontact?	comments
Water temperature	N 1 2 (3) 4 5	N 1 2 (3) 4 5	N 1 (2) 3 4 5	N 1 2 3 (4) 5	appears different interpretations placed on this
Air temperature	N 1 2 3 (4) 5	N 1 2 3 (4) 5	N 1 2 (3) 4 5	N 1 2 (3) 4 5	(relative to norms, and absolute)
Sunlight	N 1 2 (3) 4 5	N 1 2 (3) 4 5	N 1 2 3 (4) 5	N 1 2 (3) 4 5	
Wind	N (1) 2 3 4 5	N (1) 2 3 4 5	N (1) 2 3 4 5	N 1 (2) 3 4 5	

Development and management

	effect on homebased contact?	effect on nonhomebased contact?	effect on homebased noncontact?	effect on nonhomebased noncontact?	comments
Ancillary facilities/opportunities	N 1 (2) 3 4 5	N 1 2 (3) 4 5	N 1 (2) 3 4 5	N 1 2 3 (4) 5	
Parking	N 1 2 (3) 4 5	N 1 2 3 (4) 5	N 1 2 (3) 4 5	N 1 2 3 (4) 5	
Development aesthetics/intrusions	N 1 2 3 (4) 5	N 1 2 (3) 4 5	N (1) 2 3 4 5	N 1 2 (3) 4 5	
Incompatible recreational activities	N 1 2 1 4 5	N 1 2 1 4 5	N 1 2 3 4 5	N 1 2 3 4 5	1 response only
Admission charges	N 1 2 (3) 4 5	N (1) 2 1 4 5	N 1 (2) 3 4 5	N (1) 2 3 4 5	important at extreme (1)
Management character and intensity	N 1 2 1 4 5	N 1 2 3 4 5	N 1 2 3 (4) 5	N 1 (2) 3 4 5	2 responses only

Social and economic

	effect on homebased contact?	effect on nonhomebased contact?	effect on homebased noncontact?	effect on nonhomebased noncontact?	comments
Long term regional demand characteristics	N 1 2 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	1 response only
Travel times/tributary population	N 1 2 (3) 4 5	N 1 2 (3) 4 5	N 1 (2) 3 4 5	N 1 2 (3) 4 5	
Travel ease	N 1 2 3 (4) 5	N 1 2 (3) 4 5	N 1 2 3 (4) 5	N 1 2 (3) 4 5	
Travel modes	N 1 2 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	1 response only interpreting this as a separate determinant
Availability of substitutable sites	N 1 2 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	2 responses only
Day of week/time of day	N 1 2 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	N 1 2 3 4 5	2 responses only

APPENDIX 3
BEACH LIST

NAME	XREF	GRID X	GRID Y D.	ZONE	COUNTY/REGION	MUNICIPALITY	HoE REG.	WATER BODY	ADMIN.	NO. B.
8th St Ossossane B APt	202-12	580	4947	6	Simcoe	Tiny	C	Huron	M	1
Albert E Crookes Memorial Pk	150-09	616	4824	3	Peel	Mississauga	C	Ontario	M	1
Albion Hills CA	150-03	595	4865	3	Peel	Caledon	C	Humber R	CA	1
Algunquin PPk/Rock L Cg	001-13	703	5044	7	Haliburton	unorganized	C	Rock	PPk	1
Arrowhead PPk	102-11	639	5027	7	Muskoka	Huntsville	C	Arrowhead	PPk	3
Ashbridge's Bay Pk	094-04	636	4835	2	Metro. Toronto	Toronto	C	Ontario	M	2
Atherley Pk	188-12	630	4939	6	Simcoe	Mara	C	Simcoe	M	1
Balm B Access	198-06	580	4949	6	Simcoe	Tiny	C	Huron	U	1
Balm B APt	199-13	579	4950	6	Simcoe	Tiny	C	Huron	M	1
Balm B APt	199-12	580	4949	6	Simcoe	Tiny	C	Huron	M	1
Balsam Drive APt	199-14	580	4937	6	Simcoe	Tiny	C	Huron	M	1
Balsam L PPk	208-01	669	4944	8	Victoria	Bexley	C	Balsam	PPk	1
Barr Point Christian Is. APt	203-17	567	4959	6	Simcoe	Christian I. IR	C	Huron	C	1
Bayfield Pk	202-16	584	4961	6	Simcoe	Tiny	C	Huron	M	1
Bayfort Camp	197-08	591	4956	6	Simcoe	Tay	C	Huron	C	1
Bayview Pk	098-15	593	4968	7	Muskoka	Georgian Bay	C	Huron	C	1
Bayview-Wildwood Resorts Ltd.	191-18	626	4961	6	Simcoe	Orillia Twp	C	Sparrow	C	1
Beach Pk	201-10	717	4869	8	Northumberland	Port Hope	C	Ontario	M	1
Beau Rivage Ave. APt	124-05	574	4953	6	Simcoe	Tiny	C	Huron	M	1
Beavermead Pk	160-15	715	4908	8	Peterborough	Peterborough	C	Otonabee R	M	1
Belle Vue Ave. APt	199-15	574	4953	6	Simcoe	Tiny	C	Huron	M	1
Bemaba Lodge	051-13	674	5015	7	Haliburton	Sherborne et al.	C	Kawagama	C	1
Betty Avenue Access	199-06	581	4944	6	Simcoe	Tiny	C	Huron	M	1
Blen Venue Ave APt	202-05	575	4953	6	Simcoe	Tiny	C	Huron	M	1
Big Chief Camp	193-06	626	4946	6	Simcoe	Orillia Twp	C	Couchiching	Pr	1
Big East R Hotel	103-10	639	5026	7	Muskoka	Huntsville	C	Big East R	C	1
Birch Avenue APt	199-16	580	4937	6	Simcoe	Tiny	C	Huron	M	1
Birch Point Lodge	044-12	692	4986	7	Haliburton	Dysart et al.	C	Kashagawigamog	C	1
Birdsall B Trailer Pk	161-10	734	4905	8	Peterborough	Otonabee	C	Rice	C	1
Bugart's Cottages	109-04	619	5003	7	Muskoka	Huskoka Lakes	C	Three Mile	C	1
Bonnie Lake Cottages & Camping	097-17	636	5000	7	Muskoka	Bracebridge	C	Bonnie	C	1
Braeside Lodge and Hotel	649-01	677	4969	7	Haliburton	Lutterworth	C	Gull	C	1
Brewery Bay B & Tennis C.	193-02	628	4940	6	Simcoe	Orillia C	C	Couchiching	Pr	1
Brickell's Cottages	052-10	673	4997	7	Haliburton	Stanhope	C	Kushog	C	1
Brook Avenue APt	201-11	579	4950	6	Simcoe	Tiny	C	Huron	M	1
Bruce's Hill CA	225-06	632	4867	3	York	Whitchurch-S'ville	C	Bruce Cr	CA	1
Buckslide Tent & Trailer Pk	052-11	677	4991	7	Haliburton	Stanhope	C	Kushog	C	1
Camp Fisherman	158-14	700	4929	8	Peterborough	Harvey	C	Pigeon	Pr	1
Camp Kiwanis Vesle Skaugum	107-17	658	5035	7	Muskoka	Lake of Bays	C	Dotty	Pr	1
Cawaja B Access	198-07	579	4950	6	Simcoe	Tiny	C	Huron	U	1
Cawaja B APt	199-17	578	4950	6	Simcoe	Tiny	C	Huron	P	1
Cedar B Pk	225-08	618	4877	3	York	Whitchurch-S'ville	C	Musselman	P	1
Cedar Drive Alt	199-18	580	4937	6	Simcoe	Tiny	C	Huron	M	1
Cedar Grove Road APt	201-12	571	4954	6	Simcoe	Tiny	C	Huron	M	1
Cedar Lane Access	198-08	580	4935	6	Simcoe	Tiny	C	Huron	M	1
Cedardale Camp	121-16	287	4878	8	Northumberland	Brighton Twp	C	Ontario	C	1
Cedars Cottages	213-06	675	4961	B	Victoria	Somerville	C	Balsam	C	1
Cedar Grove Cgs	190-17	571	4924	6	Simcoe	Wasaga Beach	C	Huron	M	1

NAME	WET	DRY	L.	U.A.	EFF. L.	TEMP.	LOC.	AES.	MON.	ZP. 86	ZP. 85	ZP. 84	ZP. X
8th St Ossossane B APt	3	3	160	0	160	F		4					
Albert E Crookes Memorial Pk	3	3	105	0	105	P		3					
Albion Hills CA	6	5	180	0	180	E		3	MNR				
Algonquin PPk/Rock L Cg	3	2	194	0	194	P		5					
Arrowhead PPk	3	3	505	0	505	F		3	MNR	67%	50%		39%
Asherley Pk	3	4	348	0	348	G		1					
Balm B Access	5	2	180	0	180	G		3					
Balm B APt	3	4	400	1	400	F		3					
Balm B APt	4	4	400	1	400	F		4					
Balsam Drive APt	3	2	125	0	125	F		4					
Balsam L PPk	3	2	130	0	130	F		4	MNR				
Barr Point Christian Is. APt	4	4	450	1	410	G		4					
Bayfield Pk	4	5	600	0	440	F		6					
Bayfort Camp	4	3	195	0	195	F		4					
Bayview Pk	5	5	143	0	143	F		3					
Bayview-Wildwood Resorts Ltd.	5	2	215	0	215	F		4					
Beach Pk	4	2	120	0	120	G		2					
Beau Rivage Ave. APt	2	5	198	0	198	P		2					
Beavermead Pk	2	6	175	0	175	E		1		67%	75%		47%
Belle Vue Ave. APt	4	3	150	0	150	E		4					
Bemaba Lodge	2	2	275	0	275	F		4					
Betty Avenue Access	3	3	123	1	123	P		4					
Bien Venue Ave APt	4	3	400	0	400	F		3					
Big Chief Camp	2	2	250	0	250	F		3					
Big East R Motel	3	3	119	0	119	G		4					
Birch Avenue APt	3	2	100	0	100	F		4					
Birch Point Lodge	4	3	130	0	130	F		5					
Birdsall B Trailer Pk	6	4	284	0	284	F		3					
Bogart's Cottages	6	2	100	0	100	E		5					
Bonnie Lake Cottages & Camping	5	4	100	0	100	F		5					
Braeside Lodge and Hotel	4	2	183	0	183	F		3					
Brewery Bay B & Tennis C.	4	2	211	0	211	F		2					
Brickell's Cottages	2	3	119	0	119	G		3					
Brook Avenue APt	4	3	168	0	168	F		4					
Bruce's Mill CA	5	2	250	0	250	F		2		11%	67%	26%	
Buckslide Tent & Trailer Pk	5	4	174	0	174	E		4					
Camp Fisherman	4	3	244	0	244	E		4					
Camp Kiwanis Vesle Skaugum	3	2	180	0	180	G		4					
Cawaja B Access	3	3	145	0	145	P		4					
Cawaja B APt	2	3	100	1	100	F		4					
Cedar B Pk	3	3	400	0	400	F		4					
Cedar Drive APt	3	2	152	0	152	E		4				22%	7%
Cedar Grove Road APt	2	3	100	1	100	F		3					
Cedar Lane Access	3	3	475	0	415	F		4					
Cedardale Camp	2	3	500	0	420	F		4					
Cedars Cottages	5	2	430	0	406	G		3					
Cedar-Grove Cgs	5	2	240	0	240	F		2					
Centennial Pk	1	5	230	0	230	G		2		11%			4%

NAME	XREF	GRID X	GRID Y	D. ZONE	COUNTY/REGION	MUNICIPALITY	MoE REG.	WATER BODY	ADMIN.	NO. B.
Chez Nous Ave. Access	199-08	575	4953	6	Simcoe	Tiny	C	Huron	P	1
Claireville CA	150-01	608	4845	3	Peel	Brampton	C	Claireville	CA	1
Clover Leaf Cottages	049-14	663	5026	7	Haliburton	Sherborne et al.	C	Oxtongue	C	1
Cobourg Yacht Club	123-18	727	4871	8	Northumberland	Cobourg	C	Ontario	Pr	1
Con IV Tiny APt	201-18	579	4940	6	Simcoe	Tiny	C	Huron	M	1
Con IX Tiny APt	199-19	580	4948	6	Simcoe	Tiny	C	Huron	M	1
Con V Tiny APt	199-20	580	4942	6	Simcoe	Tiny	C	Huron	P	1
Con VIII Tiny APt	201-13	581	4947	6	Simcoe	Tiny	C	Huron	M	1
Con XI APt	200-01	578	4950	6	Simcoe	Tiny	C	Huron	M	1
Con XIII Pk and Access	202-18	577	4953	6	Simcoe	Tiny	C	Huron	M	1
Con XIV APt	201-04	575	4953	6	Simcoe	Tiny	C	Huron	M	1
Con XV APt	201-05	573	4954	6	Simcoe	Tiny	C	Huron	P	1
Con XVI Reach Pk	202-19	572	4954	6	Simcoe	Tiny	C	Huron	M	1
Con XX APt	201-06	569	4959	6	Simcoe	Tiny	C	Huron	M	1
County Road 25 APt	201-16	580	4949	6	Simcoe	Tiny	C	Huron	M	1
County Road 29 APt	201-07	580	4941	6	Simcoe	Tiny	C	Huron	M	1
County Road 6 APt	201-15	575	4961	6	Simcoe	Tiny	C	Huron	M	1
Crystal B Cottages	109-15	626	4990	7	Muskoka	Muskoka Lakes	C	Muskoka	C	1
Culver Trail APt	199-21	580	4936	6	Simcoe	Tiny	C	Huron	M	1
Darlington PPk	017-01	678	4860	3	Durham	Newcastle	C	Ontario	PPk	1
Deanlea B Assoc Inc Access	198-10	579	4940	6	Simcoe	Tiny	C	Huron	Pr	1
Deanlea B Assoc Inc Access	198-11	580	4940	6	Simcoe	Tiny	C	Huron	Pr	1
Deer Lodge	044-16	691	4986	7	Haliburton	Dysart et al.	C	Kashagawigamog	C	2
Duffin Cr Waterfront Area	016-01	658	4853	3	Durham	Ajax	C	Ontario	CA	1
Dutcher Drive APt	199-22	580	4935	6	Simcoe	Tiny	C	Huron	M	1
Dwight Public B	106-01	656	5021	7	Muskoka	Lake of Bays	C	of Bays	M	1
Earl Rowe PPk	204-02	588	4889	6	Simcoe	Tosorontio	C	Boyne R	PPk	1
Echo Hills Pk	106-15	654	5023	7	Muskoka	Lake of Bays	C	Boyne R	C	1
Edgewater B	050-13	690	4885	7	Haliburton	Anson, Il. & M.	C	Kashagawigamog	C	2
Emily PPk	209-05	697	4912	8	Victoria	Emily	C	Pigeon	PPk	1
Enchantement Ave. APt	201-17	574	4953	6	Simcoe	Tiny	C	Huron	M	1
Fairfield Bay Cottages	050-14	680	4984	7	Haliburton	Anson, Il. & M.	C	Mountain	C	1
Farlain L APt	200-02	582	4962	6	Simcoe	Tiny	C	Farlain	M	1
Frailcks B lot	018-09	669	4897	3	Durham	Scugog	C	Scugog	M	3
Georgina B APt	2(0-05	580	4943	6	Simcoe	Tiny	C	Huron	P	1
Grandolph Bay Access	225-10	639	4876	3	York	Whitchurch-S'ville	C	Musselman	C	1
Haliburton Lodge	198-13	576	4953	6	Simcoe	Tiny	C	Huron	D	1
Hallmar Resort Ltd.	044-03	704	4998	7	Haliburton	Dysart et al.	C	Drag	C	1
Hide-a-Way Inn	044-18	692	4986	7	Haliburton	Dysart et al.	C	Kashagawigamog	C	1
High Street APt	203-03	570	4924	6	Simcoe	Wasaga Beach	C	Huron	C	1
Hollow Valley Lodge and Tavern	200-06	578	4951	6	Simcoe	Tiny	C	Huron	C	1
Innes L Pk	051-15	667	5013	7	Haliburton	Sherborne et al.	C	of Bays	C	2
Innisfil Centennial Pk	150-05	593	4858	3	Peel	Caledon	C	Innis	C	1
Innisfil Pk	186-04	608	4904	6	Simcoe	Innisfil	C	Lovers Cr?	C	1
Inverlea Pk	186-16	617	4908	6	Simcoe	Innisfil	C	Simcoe	M	1
Iroquois B	160-16	714	4910	8	Peterborough	Peterborough	C	Otonabee R	M	1
Ispiming B Access	019-04	666	4857	3	Durham	Whitby	C	Ontario	M	1
Jack Darling Memorial Pk	199-10	570	4955	6	Simcoe	Tiny	C	Huron	M	1
Johnson B	150-10	612	4820	3	Peel	Mississauga	C	Ontario	M	1
Jubalee B Pk	204-06	606	4916	6	Simcoe	Barrie C	C	Simcoe	M	1
Juniper Trail Access	122-08	262	4874	8	Northumberland	Haldimand Twp	C	Ontario	=	1
...n R...Pt	198-14	580	24936	6	Simcoe	Tiny	C	Huron	M	1

NAME	WET	DRY	L.	U.A.	EFF. L.	TEMP.	LOC.	AES.	MON.	ZP. 86	ZP. 85	ZP. 84	ZP. X
Chez Nous Ave. Access	4	3	290	0	290	F		4					
Claireville CA	3	5	150	0	150	E		1				100%	31%
Clover leaf Cottages	3	4	152	0	152	P		3					
Cobourg Yacht Club	3	4	158	1	158	P		2					
Con IV Tiny APt	4	3	600	0	440	F		4					
Con IX Tiny APt	4	2	390	1	390	F		4					
Con V Tiny APt	3	3	650	1	450	F		4					
Con VIII Tiny APt	3	3	450	1	410	F		4					
Con XI APt	4	4	800	1	480	F		4					
Con XIII Pk and Access	3	4	800	0	480	F		4					
Con XIV APt	4	3	550	1	430	F		4					
Con XV APt	3	3	190	0	190	F		4					
Con XVI Reach Pk	3	3	430	1	406	F		5					
Con XX APt	3	3	153	0	153	F		4					
County Road 25 APt	4	4	180	0	180	F		4					
County Road 29 APt	3	4	600	1	440	F		4					
County Road 6 APt	4	4	450	1	410	F		4					
Crystal B Cottages	0	3	136	0	136	F		3					
Culver Trail APt	3	3	200	0	200	F		4					
Darlington PPk	2	2	152	0	152	P		2	MNR				
Deanlea B Assoc Inc Access	4	5	320	0	320	F		4					
Deanlea B Assoc Inc Access	3	4	300	0	300	F		4					
Deer Lodge	4	3	144	0	144	F		3					
Duffin Cr Waterfront Area	3	2	402	0	400	P		2					
Dutcher Drive APt	4	3	400	1	400	F		3	MNR				
Dwight Public B	4	2	212	0	212	F		3					
Earl Rowe PPk	3	6	534	0	534	G		3					
Echo Hills Pk	4	3	102	0	102	F		3					
Edgewater B	4	3	274	0	274	F		4					
Emily PPk	3	4	283	0	283	G		4	MNR				
Enchantement Ave. APt	4	3	500	1	420	F		4					
Fairfield Bay Cottages	3	4	124	0	124	F		3					
Farlain L APt	2	2	875	0	875	F		4					
Fralicks B Lot	2	2	100	0	100	E		4					
Georgina B APt	3	4	670	1	454	F		4					
Glendale B	2	4	305	0	305	R		4					
Grandolph Bay Access	4	3	100	1	100	F		6					
Hallburton Lodge	3	5	1160	0	552	F		5					
Hallmar Resort Ltd.	4	2	300	0	300	F		2					
Hilde-a-Way Inn	2	4	117	0	117	F		4					
High Street APt	2	4	200	0	200	E		3					
Hollow Valley Lodge and Tavern	4	6	141	0	141	F		4					
Innes L Pk	2	2	240	0	240	E		4					
Innisfil Centennial Pk	2	5	315	0	315	G		4					
Innisfil Pk	4	2	750	1	470	G		1					
Inverlea Pk	1	3	150	0	150	E		2		89%	100%		63%
Iroquois B	3	3	390	0	390	P		2					
Ispiming B Access	4	1	125	0	125	P		5					
Jack Darling Memorial Pk	4	4	165	0	165	P		1		22%	25%	11%	11%
Johnson B	2	3	125	0	125	G		2					8%
Inhalee B Pk	3	3	384	0	384	F		3					
Juniper Trail Access	3	3	475	1	415	F		4					
Karen Road APt	3	4	700	1	460	F		4					

NAME	XREF	GRID X	GRID Y	D. ZONE	COUNTY/REGION	MUNICIPALITY	MoE REG.	WATER BODY	ADMIN.	NO. B.
Kelso CA	055-07	586	4818	3	Halton	Milton	C	Kelso	CA	1
Kinsmen B Pk	102-18	636	5021	7	Muskoka	Huntsville	C	Vernon	M	1
Kushog Korner Cottages	053-07	670	5000	7	Haliburton	Stanhope	C	St. Nora	C	1
Lagoon City Community B	189-02	642	4934	6	Simcoe	Mara	C	Simcoe	Pr	1
Lagoon Trailer Pk	104-07	640	5026	7	Muskoka	Huntsville	C	Big East R	C	1
Lake Breeze Cottages	212-08	667	4957	8	Victoria	Laxton, D. & L.	C	Head	C	1
Lakefield Pk	162-03	717	4923	8	Peterborough	Lakefield	C	Katchewanooka	M	1
Lakeside Pk	150-11	612	4816	3	Peel	Mississauga	C	Ontario	M	1
Lakeview Lane APt	201-19	572	4955	6	Simcoe	Tiny	C	Huron	M	1
Lakeview Lodge	051-02	688	4990	7	Haliburton	Anson, H. & H.	C	Soyers	C	2
Lakeview Pk	017-06	674	4859	3	Durham	Oshawa	C	Ontario	M	2
Lang Hill CA	161-08	726	4906	8	Peterborough	Otonabee	C	Indian R	CA	1
Laurel Avenue APt	200-08	579	4939	6	Simcoe	Tiny	C	Huron	M	1
Laurence Pk	204-09	606	4919	6	Simcoe	Vespra	C	Little	C	1
Lawsons Cottages	106-19	651	5004	7	Muskoka	Lake of Bays	C	Echo	C	1
Lehman's Timber Sands	160-11	734	4955	8	Peterborough	Belmont & Methuen	C	Jack	C	1
Leo's Boat Livery	123-12	725	4891	8	Northumberland	Hamilton Twp	C	Rice	C	1
lesperance Dr. APt	200-09	576	4953	6	Simcoe	Tiny	C	Huron	P	1
Liverpool Road Beachfront Pk	017-08	655	4853	3	Durham	Pickering	C	Ontario	M	1
Locust Trail Access	198-15	580	4936	6	Simcoe	Tiny	C	Huron	U	1
Mackenzie Pk	196-22	597	4956	6	Simcoe	Victoria Harbour	C	Huron	M	1
Maple Sands Resort	053-11	684	4997	7	Haliburton	Stanhope	C	Maple	C	1
Mara PPk	187-11	611	4938	6	Simcoe	Mara	C	Simcoe	PPk	1
Marle Curtis Pk	094-01	617	4826	2	Metro. Toronto	Etobicoke	C	Ontario	M	1
Harygrove Camp	204-01	586	4965	6	Simcoe	Tiny	C	Huron	Pr	1
Maurice Road APt	202-04	570	4955	6	Simcoe	Tiny	C	Huron	M	1
McRae Point PPk	187-12	633	4936	6	Simcoe	Mara	C	Simcoe	PPk	1
Midland Little L Pk	197-01	588	4955	6	Simcoe	Midland	C	Midland Park	M	1
Milne CA	224-16	638	4857	3	York	Markham	C	Rouge R	CA	1
Milne's Dam APk	225-01	640	4859	3	York	Markham	C	Rouge R	M	1
Milnet Point Pk	186-05	606	4914	6	Simcoe	Barrie C	C	Simcoe	M	1
Monague B Chrls. Is. APt	203-19	562	4963	6	Simcoe	Christian I. IR	C	Huron	C	1
Monica Road APt	200-13	579	4939	6	Simcoe	Tiny	C	Huron	C	1
Moonlight Bay Cottages	101-11	628	4976	7	Muskoka	Gravenhurst	C	Gull	C	1
Moorelands Kawagama Camp	052-02	674	5016	7	Haliburton	Sherborne et al.	C	Kawagama	Pr	2
Mountain View B APt	202-07	581	4946	6	Simcoe	Tiny	C	Huron	M	1
Nottawaga B APt	200-14	577	4952	6	Simcoe	Tiny	C	Huron	P	1
N. of Betty Ave. APt	201-20	581	4944	6	Simcoe	Tiny	C	Huron	M	1
N. of Con XVI APt	201-21	572	4955	6	Simcoe	Tiny	C	Huron	M	1
N. of Red Pine Trail APt	202-08	580	4936	6	Simcoe	Tiny	C	Huron	M	1
Oblong L Cottages	047-06	701	5005	7	Haliburton	Dysart et al.	C	Oblong	C	1
Ont Govt Staff Development Ctr	184-04	613	4915	6	Simcoe	Innisfil	C	Simcoe	Pr	1
Oro Memorial Pk	194-02	620	4924	6	Simcoe	Oro	C	Simcoe	M	1
Ossossane B APt	200-16	581	4947	6	Simcoe	Tiny	C	Huron	M	1
Ossossane B APt	200-17	580	4947	6	Simcoe	Tiny	C	Huron	M	3
Ossossane B APt	200-15	580	4947	6	Simcoe	Tiny	C	Huron	P	1
Ossossane B APt	200-19	580	4948	6	Simcoe	Tiny	C	Huron	M	1
Oxtongue L Cottages	049-16	662	5026	7	Haliburton	Sherborne et al.	C	Oxtongue	C	1
Paradise Point Pk	197-02	594	4958	6	Simcoe	Port McNicoll	C	Huron	M	1
Park Road APt	200-21	580	4935	6	Simcoe	Tiny	C	Huron	C	1
Parkwood B Cg Ltd.	043-10	735	4985	7	Haliburton	Bicroft	C	Paudash	C	1
Paudash L Access	043-02	731	4986	7	Haliburton	Cardiff	C	Paudash	P	1
DeWle Beach Christian Is A C	203-16	560	4964	6	Simcoe	Christian I. IR	C	Huron	C	1

NAME	WET	DRY	L.	U.A.	EFF. L.	TEMP.	LOC.	AES.	HON.	ZP. 86	ZP. 85	ZP. B4	ZP. X
Kelso CA	4	5	270	0	270	E	4						
Klnsmen B Pk	5	3	160	0	160	F	3						
Kushog Korner Cottages	3	2	152	0	152	F	3						
Lagoon City Community B	6	2	195	0	195	G	4						
Lagoon Trailer Pk	2	2	188	0	188	F	3						
Lake Breeze Cottages	3	4	916	1	503	G	5						
Lakefield Pk	2	5	125	0	125	E	2						
Lakeside Pk	4	5	162	0	162	P	1						
Lakeview Lane APt	4	3	150	0	150	F	4						
Lakeview Lodge	4	4	210	0	210	P	5						
Lakeview Pk	4	4	395	0	395	P	1						
Lang Mill CA	4	4	195	0	195	E	4			22%	100%		41%
Laurel Avenue APt	3	3	700	1	460	F	2						
Lawrence Pk	4	4	105	0	105	G	2						
Lawsons Cottages	6	3	210	0	210	P	3						
Lehman's Timber Sands	4	4	111	0	111	G	4						
Leo's Boat Livery	4	2	102	0	102	E	4						
Lesperance Dr. APt	4	4	200	0	200	F	4						
Liverpool Road Beachfront Pk	3	5	533	1	427	C	2						
Locust Trail Access	3	3	350	0	350	F	4						
Mackenzie Pk	3	4	123	0	123	F	3						
Maple Sands Resort	5	5	1B3	0	183	G	3						
Mara PPk	4	4	180	0	180	G	3		MNR				
Marie Curtis Pk	3	4	518	0	518	P	1			100%	88%	50%	79%
Marygrove Camp	4	2	105	0	105	F	4						
Maurice Road APt	4	3	250	0	250	F	5						
McRae Point PPk	4	3	394	0	394	C	5		MNR				
Midland Little L. Pk	4	4	1080	0	1080	F	2					11%	4%
Milne CA	5	4	183	0	183	E	1						
Milne's Dam APk	3	4	102	0	102	E	2			100%	100%		67%
Minet Point Pk	4	4	138	0	138	G	6						
Monague B Chris. Is. APt	3	3	800	1	480	F	4						
Monica Road APt	3	3	650	1	450	F	2						
Moonlight Bay Cottages	3	3	148	0	148	F	5						
Moorelands Kawagama Camp	3	3	135	0	135	P	5						
Mountain View B APt	3	3	800	1	480	F	4						
Nottawaga B APt	3	4	800	1	420	F	4						
N. of Betty Ave. APt	3	2	500	1	440	F	4						
N. of Con XVI APt	4	3	600	1	150	P	4						
N. of Red Pine Trail APt	2	3	150	0	147	P	4						
Oblong L Cottages	2	2	240	0	240	G	4						
Ont Govt Staff Development Ctr	2	4	262	0	262	G	4						
Oro Memorial Pk	3	2	220	0	220	F	4						
Ossossane B APt	3	2	575	1	575	F	4						
Ossossane B APt	4	4	170	0	170	F	4						
Ossossane B APt	4	4	300	0	300	F	4						
Oxtongue L Cottages	5	4	146	0	146	P	3						
Paradise Point Pk	2	4	201	0	201	F	4						
Park Road APt	3	3	475	1	415	F	4						
Parkwood B Cg Ltd.	4	3	510	1	426	F	3						
Paudash L Access	3	4	146	0	146	F	3						
Pebble Beach Christian Is A.C	4	2	300	0	300	F	6						

NAME	XREF	GRID X	GRID Y	D. ZONE	COUNTY/REGION	MUNICIPALITY	MoE REG.	WATER BODY	ADMIN.	NO. B.
Penetanguishene APk	202-13	583	4957	6	Simcoe	Penetanguishene	C	Huron	M	
Peninsula Mtl & Sunnybrooke B	222-19	642	4911	3	York	Georgina	C	Simcoe	C	2
Petticoat Cr CA	017-10	652	4851	3	Durham	Pickering	C	Ontario	CA	
Picnic Chandos L	155-14	264	4969	8	Peterborough	Chandos	C	Chandos	P	1
Pine Forest Beach Est Ltd A P	203-13	579	4940	6	Simcoe	Tiny	C	Huron	Pr	1
Pine Valley Camp	107-05	659	4997	7	Muskoka	Lake of Bays	C	Black R	Pr	1
Pinedale Inn Hotel	101-15	629	4975	7	Muskoka	Gravenhurst	C	Gull	C	1
Pinelands Lodge	111-08	609	4995	7	Muskoka	Huntsville	C	Joseph	C	1
Port Sydney B	103-04	635	5009	7	Muskoka	Huntsville	C	Mary	M	1
Presqu'Ile PPk	121-15	281	4876	8	Northumberland	Brighton Twp	C	Ontario	PPk	1
Preston L Pk	225-11	629	4871	3	York	Whitchurch-S'ville	C	Preston	C	1
Prince Albert Parkwy APt	203-14	579	4940	6	Simcoe	Tiny	C	Huron	Pr	1
Rainbow Valley Cgs	183-13	592	4926	6	Simcoe	Flos	C	Nottawasaga R?	C	1
Red Deer Cottages	104-15	633	5024	7	Muskoka	Huntsville	C	Vernon	Pr	1
Red Pine Trail APt	200-22	580	4936	6	Simcoe	Tiny	C	Huron	M	1
Riverwood Trailer Pk	213-03	681	4910	8	Victoria	Ops	C	Scugog R	C	1
Roger's Cove Pk	160-14	715	4909	8	Peterborough	Peterborough	C	Otonabee R	M	1
Ronville Lodge	107-10	658	5016	7	Muskoka	Lake of Bays	C	of Bays	C	1
Rostrevor B Resort	111-14	612	5005	7	Muskoka	Muskoka Lakes	C	Rosseau	C	1
Sandy Bay B APt	203-21	563	4967	6	Simcoe	Christian I. IR	C	Huron	C	1
Scanlon Cr CA	204-11	615	4889	8	Simcoe	West Gwillimbury	C	Scanlon Cr	CA	1
Serpent Mounds PPk	161-05	727	4899	8	Peterborough	Otonabee	C	Rice	PPk	1
Shadow L Camp	225-11	639	4878	3	York	Whitchurch-S'ville	C	unknown	Pr	1
Shelter Valley Pk	122-10	260	4978	8	Northumberland	Haldimand Twp	C	Shelter Valley Cr	C	1
Silent L PPk	043-03	731	5024	7	Haliburton	Cardiff	C	Silent	PPk	1
Silver Birch Trail APt	202-11	580	4937	6	Simcoe	Tiny	C	Huron	M	1
Silver Sands T & T Pk	104-16	639	5024	7	Muskoka	Huntsville	C	Big East R	C	1
Sir Casimir Gzowski Pk	094-12	623	4832	2	Metro. Toronto	Toronto	C	Ontario	C	1
Sir Sam's Inn and Ski Area	046-12	698	5001	7	Haliburton	Dysart et al.	C	Eagle	C	1
Six Mile L PPk	098-13	598	4971	7	Muskoka	Georgian Bay	C	Six Mile	PPk	1
South L Trailer Pk	052-05	682	4953	7	Haliburton	Snowdon	C	South	C	1
Souvenir Avenue APt	201-01	574	4953	6	Simcoe	Tiny	C	Huron	M	1
Suncity Trailer Pk	190-19	559	4930	6	Simcoe	Nottawasaga	C	Wilcox	C	1
Sunset B Pk	225-02	626	4867	3	York	Richmond Hill	C	Duffins Cr	C	1
Swiss Chalet Pk	017-14	654	4866	3	Durham	Pickering	C	Huron	C	1
S. of Betty Ave Access	198-16	581	4944	6	Simcoe	Tiny	C	Huron	U	1
S. of Locust Trail APt	202-10	580	4936	6	Simcoe	Tiny	C	Huron	M	1
The Homestead Cottage Resort	053-19	679	4994	7	Haliburton	Stanhope	C	Boshkung	C	1
The Old Mill Cottage Resort	051-08	681	4990	7	Haliburton	Anson, ll. & M.	C	Twelve Mile	C	1
Thorah Centennial Pk	016-12	646	4925	3	Durham	Brock	C	Simcoe	M	1
Toronto Islands	094-05	631	4831	2	Metro. Toronto	Toronto	C	Ontario	M	4
Tottenham CA	198-05	595	4875	6	Simcoe	Tottenham	C	Tottenham	CA	1
Tranquillité Ave APt	201-02	574	4953	6	Simcoe	Tiny	C	Huron	M	1
Tudhope Memorial APk	191-14	628	4941	6	Simcoe	Orillia C	C	Couchiching	M	2
Victoria Centennial Pk	209-03	655	4936	8	Victoria	Eldon	C	Canal	M	1
Wahoo Cottages	123-07	728	4871	8	Northumberland	Cobourg	C	Ontario	C	1
Wasaga B PPk	213-10	674	4956	8	Victoria	Somerville	C	Shadow	PPk	3
Washago Centennial	195-07	573	4925	6	Simcoe	Wasaga Beach	C	Huron	M	
Wendake Road APt	191-17	632	4956	6	Simcoe	Orillia Twp	C	Couchiching	M	1
West of Bay Road APt	201-03	581	4943	6	Simcoe	Tiny	C	Huron	M	1
Westshore Glen Pk	202-06	580	4967	6	Simcoe	Tiny	C	Huron	C	1
[name cut off]	017-03	653	4853	3	[Haliburton?]	[Cherb... et al]	C	Oxtongue	C	1

NAME	WET	DRY	L.	U.A.	EFF. L.	TEMP.	LOC.	AES.	MON.	ZP. 86	ZP. 85	ZP. 84	ZP. X
Penetangulshene APk	4	4	180	0	180	F	2	2					
Peninsula Mtl & Sunnybrooke B	5	5	191	0	191	G		3					
Petticoat Cr CA	4	2	805	1	481	P		3					
Picnic Chandos L	4	6	165	0	165	G		3					
Plne Forest Beach Est Ltd A P	3	3	175	0	175	F		4					
Plne Valley Camp	3	3	109	0	109	F		6					
Plnedale Inn Hotel	6	2	150	0	150	F		2					
Plnelands Lodge	2	5	115	0	115	F		3					
Purt Sydney 8	5	3	125	0	125	F		3					
Presqu'ile PPk	4	6	2900	1	900	F		4	MNR				
Preston L Pk	2	3	267	0	267	E		3					
Prince Albert Parkwy APt	2	4	350	0	350	E		3	MNR				
Rainbow Valley Cgs	2	2	276	0	276	G		3					
Red Deer Cottages	3	2	106	0	106	F		4					
Red Plne Trail APt	3	3	100	0	100	F		3					
Riverwood Trailer Pk	4	5	180	0	180	E		3					
Roger's Cove Pk	6	4	244	0	244	E		1		67%	25%	33%	42%
Ronville Lodge	4	3	148	0	148	F		4					
Rustrevor B Resort	4	2	173	0	173	F		5					
Sandy Bay B APt	4	4	800	1	480	F		6					
Scanlon Cr CA	4	3	183	0	183	E		3					
Serpent Mounds PPk	3	3	100	0	100	E		4	MNR				
Shadow L Camp	3	3	130	0	130	E		4					
Shelter Valley Pk	6	2	100	0	100	E		4	MNR				
Silent L PPk	3	4	138	0	138	F		3					
Silver Birch Trail APt	3	3	500	1	420	F		3					
Silver Sands T & T Pk	2	3	241	0	241	F		3					
Sir Casimir Gzowski Pk	2	4	872	1	872	P		1		78%	100%	67%	81%
Sir Sam's Inn and Skl Area	4	3	300	0	300	P		4	MNR				
Six Mile L PPk	2	2	132	0	132	P		3					
South L Trailer Pk	5	5	153	0	153	F		3					
Souvenlr Avenue APt	4	4	175	0	175	P		4					
Sunclty Trailer Pk	4	2	102	0	102	P		3					
Sunset B Pk	4	2	242	0	242	E		3		11%			4%
Swiss Chalet Pk	3	3	209	0	209	E		4					
S. of Betty Ave Access	3	3	550	1	430	F		4					
S. of Locust Trail APt	3	3	500	1	420	F		3					
The Homestead Cottage Resort	2	4	152	0	152	F		3					
The Old Mill Cottage Resort	2	2	180	0	180	F		3					
Thurah Centennlal Pk	6	4	248	0	248	G		3					
Toronto Islands	4	4	2843	1	1849	P		2		58%	60%	2%	40%
Tottenham CA	4	4	105	0	105	E		2					
Tranqulllté Ave APt	3	3	150	0	150	E		4					
Tudhope Memorial APk	2	2	350	0	350	G		4					
Victorla Centennlal Pk	5	6	215	0	215	G		2					
Victorla Pk APk	3	4	510	1	422	F		2					
Wahoo Cottages	6	4	270	0	270	G		3					
Wasaga B PPk	5	2	14241	0	14241	F		3	MNR				
Washago Centennlal	4	2	117	0	117	G		3					
Wendake Road APt	4	2	750	1	470	F		4					
West of Bay Road APt	3	2	120	0	120	F		5					
Westshore Glen Pk	2	2	103	0	103	P		2					
White Blrches Cottages	5	2	212	0	212	P		3					

NAME	XREF	GRID X	GRID Y	D. ZONE	COUNTY/REGION	MUNICIPALITY	MoE REG.	WATER BODY	ADMIN.	NO. B.
Wig-a-mog Inn	045-07	692	4987	7	Haliburton	Dysart et al.	C	Kashagawigamog	C	1
Willow B CA	221-07	626	4908	3	York	Georgina	C	Simcoe	CA	1
Woodbine B	094-11	636	4835	2	Metro. Toronto	Toronto	C	Ontario	M	1
Woodland B APk	202-14	580	4937	6	Simcoe	Tiny	C	Huron	M	1
Wymbolwood B	203-01	581	4946	6	Simcoe	Tiny	C	Huron	M	1
Algonquin PPk/Achray B	001-02	688	5048	7	Nipissing	unorganized	NE	Grand	PPk	1
Algonquin PPk/Canisbay Cg	002-06	700	5050	7	Nipissing	unorganized	NE	Canisbay	PPk	1
Algonquin PPk/Kearney L Cg				7	Nipissing	unorganized	NE	Kearney	PPk	1
Algonquin PPk/Kiosk J.R. Camp				7	Nipissing	unorganized	NE	Kioshkokwi	Pr	1
Algonquin PPk/Kiosk Work Centre				7	Nipissing	unorganized	NE	Kioshkokwi	Pr	1
Algonquin PPk/L of Two Rivers Cg	001-04	695	5050	7	Nipissing	unorganized	NE	Two Rivers	PPk	1
Algonquin PPk/L of Two Rivers Pic.	001-07	697	5050	7	Nipissing	unorganized	NE	Two Rivers	PPk	1
Algonquin PPk/Hew L Cg	001-05	694	5050	7	Nipissing	unorganized	NE	Hew	PPk	1
Algonquin PPk/Pog L Cg	001-08	699	5049	7	Nipissing	unorganized	NE	Pog	PPk	1
Algonquin PPk/Tea L Cg	002-03	678	5042	7	Nipissing	unorganized	NE	Tea	PPk	1
Algonquin PPk/Whitefish l. J.R. Camp				7	Nipissing	unorganized	NE	Whitefish	Pr	1
Anglers Inn	133-11	587	5011	7	Parry Sound	The Archipelago	NE	Blackstone	C	1
Barrie Island Cottages	088-12	368	5087	1	Manitoulin	Barrie Island	NE	Huron	C	1
Bells Point B	003-05	713	5158	7	Algoma	Garden River 1R	NE	St. Marys R	C	1
Callander B	143-01	626	5119	7	Parry Sound	Himsworth North	NE	Nipissing	C	1
Carter Bay B	090-01	410	5051	1	Manitoulin	Carnarvon	NE	Huron	M	1
Chutes PPk	207-02	417	5119	7	Sudbury Terr. Dist.	Massey	NE	aux Sables R	PPk	1
Dunbar's Cottages	147-16	625	5068	7	Parry Sound	Strong	NE	Bernard	C	1
Esker Lakes PPk				7	Cochrane	unorganized	NE	Panagapka	PPk	1
Fairbank PPk				7	Sudbury R.M.	Walden	NE	Fairbank	PPk	1
Finlayson Point PPk				7	Nipissing	Temagami	NE	Temagami	PPk	1
Four Sands B	005-08	352	5116	7	Algoma	Blind River	NE	Huron	M	1
Gogunodowngung B	003-06	314	5123	1	Algoma	Thessalon 1R	NE	Huron	C	1
Green Acres T. & T. Pk	093-01	429	5082	1	Manitoulin	Howland	NE	Huron	C	1
Grundy L PPk	142-10	535	5087	7	Parry Sound	unorganized	NE	Grundy, Gurd	PPk	3
Halfway L PPk				7	Sudbury Terr. Dist.	unorganized	NE	Halfway	PPk	1
Hide Away Lodge	089-03	405	5085	1	Manitoulin	Billings	NE	Huron	C	1
Hockey Opportunity Camp	139-15	616	5072	7	Parry Sound	Machar	NE	Eagle	Pr	1
Hoeburg Property Access	0C4-09	361	5116	7	Algoma	The North Shore	NE	Huron	P	1
Kervin's Holiday Homes	143-16	614	5116	7	Parry Sound	Nipissing	NE	Nipissing	C	1
Kettle Lakes PPk				1	Cochrane	Timmins	NE	Slab	PPk	1
Kettle Lakes PPk				1	Cochrane	Timmins	NE	Island	PPk	1
Kettle Lakes PPk				1	Cochrane	Timmins	NE	Green	PPk	1
Killarney PPk/George L Cg				1	Manitoulin	unorganized	NE	George	PPk	5
Killbear PPk	131-03	561	5023	7	Parry Sound	Carling	NE	Huron	PPk	1
Layoloml B Inn	148-02	624	5066	7	Parry Sound	Strong	NE	Bernard	C	1
Lost Forest Pk	134-13	599	5053	7	Parry Sound	unorganized	NE	Beaver	C	1
Marten R PPk				7	Nipissing	unorganized	NE	Marten R	M	1
Massey Pk	207-03	418	5118	7	Sudbury Terr. Dist.	Massey	NE	aux Sables R?	M	1
Mattawa Island CA	120-02	676	5050	7	Nipissing	Mattawa	NE	Mattawa R	CA	1
Michaels Bay Beach	093-04	414	5050	1	Manitoulin	Tehkummah	NE	Huron	M	1
Mike's Park Resort	088-05	401	5083	1	Manitoulin	Billings	NE	Kagawong	C	1
Mikisew PPk	139-13	616	5075	7	Parry Sound	Machar	NE	Eagle	PPk	1
Mississagi PPk				1	Algoma	unorganized	NE	Flack	PPk	1
Mississagi PPk				1	Algoma	unorganized	NE	Semiwite	PPk	1
Mississagi PPk				1	Algoma	unorganizeel	NE	Christman	PPk	1
Oastler PPk	115-05	581	5018	7	Parry Sound	Foley	NE	Oastler	PPk	1
cker Lodge	00-1.	581	50		ry Sound	rmol	NE.	Pl l	C	

NAME	WET	DRY	L.	U.A.	EFF. L.	TEMP.	LOC.	AES.	MON.	ZP. 86	ZP. 85	ZP. 84	ZP. X
Wig-a-mog Inn	4	2	118	0	118	F	3			67%	50%		39%
Willow B CA	5	4	366	0	366	G	4						
Woodbine B	6	6	532	0	532	P	1						
Woodland B APk	6	3	4752	1	1270	F	4						
Wymbolwood B	3	3	400	1	400	F	4						
Algonquin PPk/Achray B	0	0		0		P	6		MNR				
Algonquin PPk/Canisbay Cg	4	2	101	0	101	P	3		MNR				
Algonquin PPk/Kearney L Cg	3	2	116	0	116	P	3		MNR				
Algonquin PPk/Kiosk J.R. Camp	0	0		0		P	3		MNR				
Algonquin PPk/Kiosk Work Centre	0	0		0		P	3		MNR				
Algonquin PPk/L of Two Rivers Cg	3	2	121	0	121	P	3		MNR				
Algonquin PPk/L of Two Rivers Pic.	3	2	196	0	196	P	3		MNR				
Algonquin PPk/Hew L Cg	4	4	171	0	171	P	3		MNR				
Algonquin PPk/Pog L Cg	2	2	112	0	112	P	3		MNR				
Algonquin PPk/Tea L Cg	2	2	102	0	102	P	3		MNR				
Algonquin PPk/Whitefish L J.R. Camp	0	0		0		P	5		MNR				
Anglers Inn	4	3	100	0	100	F	5						
Barrie Island Cottages	2	2	182	0	182	P	6						
Bells Point B	2	2	157	0	157	P	3						
Callander B	3	2	200	0	200	F	3						
Carter Bay B	4	4	2400	1	800	P	6						
Chutes PPk	1	3	364	0	364	P	3		MNR				
Dunbar's Cottages	3	2	147	0	147	P	3						
Esker Lakes PPk	0	0		0		P	6		MNR				
Fairbank PPk	0	0		0		P	4		MNR				
Finlayson Point PPk	0	0		0		F	3		MNR				
Four Sands B	4	3	386	0	386	P	2						
Gogunodowngung B	6	2	812	1	482	P	5						
Green Acres T. & T. Pk	6	2	303	0	303	P	3		MNR				
Grundy L PPk	0	2	1055	0	1055	P	3		MNR				
Halfway L PPk	0	0		0		F	3						
Hide Away Lodge	6	2	242	0	242	P	5						
Hockey Opportunity Camp	4	2	125	0	125	P	5						
Hoeburg Property Access	2	3	113	0	113	P	5						
Kervin's Holiday Homes	4	2	300	0	300	F	3						
Kettle Lakes PPk	0	0		0		P	3		MNR				
Kettle Lakes PPk	0	0		0		P	3		MNR				
Killarney PPk/George L Cg	0	0		0		P	3		MNR				
Killbear PPk	4	4	1938	0	1938	F	5		MNR				
Laytoml B Inn	6	4	331	0	331	P	5						
Lost Forest Pk	2	2	136	0	136	P	5						
Marten R PPk	1	3		0		P	3		MNR				
Massey Pk	3	3	160	0	160	F	3						
Mattawa Island CA	4	5	106	0	106	P	2						
Mike's Park Resort	6	1	1600	1	640	P	6						
Mikisew PPk	6	4	121	0	121	P	3						
Mississagi PPk	6	4	139	0	139	P	4		MNR				
Mississagi PPk	0	0		0		P	5		MNR				
Mississagi PPk	0	0		0		P	5		MNR				
Oastler L PPk	4	3	255	0	255	F	3		MNR				
Pickerel L Lodge	4	1	114	0	114	P	6		MNR				

NAME	WET	DRY	L.	U.A.	EFF. L.	TEMP.	LOC.	AES.	MON.	ZP. 86	ZP. 85	ZP. 84	ZP. X
Pine Haven Lodge	4	4	105	0	105	P	3	4					
Pinecrest T & T Pk	2	5	181	0	181	P	3	3					
Providence Bay B	6	3	1564	1	953	P	3	3					
Rathburn Bay B	4	4	800	1	480	P	6	6					
Restoule PPk	4	4	650	1	450	F	3	3	MNR				
Robinson Twp - Silver L	5	2	480	1	416	P	5	5					
Samuel de Champlain PPk	3	3	760	1	472	P	3	3	MNR				
Sand Bay Resnrt	3	2	135	0	135	P	6	6					
Sand L Cabins	3	2	128	0	128	P	3	3					
Sandhurst 4 Seasons	4	3	350	0	350	P	3	3					
Shangrila Camping Resort	2	3	153	0	153	P	3	3					
Spanish River 1R	3	3	152	0	152	P	6	6					
Srigley Bay B	4	2	640	1	448	P	6	6					
Star L Lodge & Campsite	5	2	270	0	270	F	5	5					
Strong Twp Pk	6	3	141	0	141	P	5	5					
Sunlit Bay Tent & Trailer Pk	3	3	150	0	150	F	5	5					
Waltonian Inn	4	0	280	0	280	F	3	3					
Windy L PPk	0	0		0		F	3	3	MNR				
Winnetou Resort	5	2	125	0	125	P	5	5					
Aaron PPk	0	0		0		P	3	3	MNR				
Blue L PPk	0	0		0		P	3	3	MNR				
Caliper L PPk	0	0		0		F	3	3	MNR				
Kakabeka Falls PPk	0	0		0		F	1	1	MNR				
L of the Woods PPk	0	0		0		F	5	5	MNR				
Ojibway PPk	0	0		0		P	3	3	MNR				
Pakwash PPk	0	0		0		P	3	3	MNR				
Quetico PPk/Dawson Trail Cg	0	0		0		P	3	3	MNR				
Rushing R PPk	0	0		0		P	3	3	MNR				
Sioux Narrows PPk	0	0		0		F	3	3	MNR				
Adolphustown Pk	3	3	200	0	200	F	3	3					
Barry's Bay Public B	4	3	165	0	165	P	3	3					
Baxter CA	2	5	244	0	244	C	4	4					
Bay Haven	6	6	244	0	244	F	4	4					
Bon Echo PPk	3	3	350	0	350	G	3	3	MNR				
Bona Vista Trailer Pk	2	3	118	0	118	F	3	3					
Bonnechere PPk	6	5	306	0	306	F	3	3	MNR				
Britannia Pk	5	5	194	0	194	G	1	1		44%		78%	41%
Brown's Bay Pk	3	5	190	0	190	G	4	4					
Camp Madawaska	2	2	225	0	225	P	6	6					
Canoe L T. & T. Pk	3	2	115	0	115	G	5	5					
Carillon PPk	3	6	701	0	701	G	3	3	MNR				
Carson L Cottages	5	2	105	0	105	P	5	5					
Cedar B Camp	2	3	249	0	249	F	3	3					
Cedar Shade Cg	4	5	122	0	122	G	3	3					
Charleston L PPk	3	3	260	0	260	G	4	4	MNR				
Charlottenburgh Pk	5	6	180	0	180	G	3	3		33%			11%
Chippawa Lodge	4	2	303	0	303	P	5	5					
Cold Cr Road B	5	2	400	1	400	F	4	4					
Cove B Pk	6	2	402	0	402	G	4	4					
Crysler Memorial Pk	5	4	330	0	330	G	3	3					
Davis B	3	2	100	0	100	P	4	4					
Desert L Cg	3	2	300	0	300	G	4	4					
Domaine Chartrand	4	3	244	0	244	G	4	4					

NAME	XREF	GRID X	GRID Y	D.	ZONE	COUNTY/REGION	MUNICIPALITY	HoE REG.	WATER BODY	ADMIN.	NO. B.
Dunne's Resort	178-01	301	5060		8	Renfrew	Hagarty & Richards	SE	Round	C	1
Dupont of Canada Ltd.	030-04	376	4896		8	Frontenac	Kingston Twp	SE	Ontario	Pr	1
Edgewater Pk Trailer Camp	166-06	318	4867		8	Prince Edward	Hallowell	SE	West	C	1
Farran Pk	206-04	501	4981		9	Stormont	Osnabruck	SE	St. Lawrence R	PPk	1
Fitzroy PPk	127-01	405	5037		8	Ottawa-Carleton	West Carleton	SE	Ottawa R	PPk	2
Flinton Pk	059-09	317	4937		8	Hastings	Elzevir & G'thorpe	SE	Skootamatta R	C	1
Gardner's Lodge	026-10	333	4965		8	Frontenac	Barrie Twp	SE	Kashwakamak	C	1
Gillies Bros. B	174-05	390	5035		8	Renfrew	Braeside	SE	Ottawa R	C	1
Glengarry Pk	034-05	542	5000		9	Glengarry	Lancaster Twp	SE	St. Lawrence R	PPk	1
Grass Cr Pk	032-05	396	4905		8	Frontenac	Pittsburgh	SE	St. Lawrence R	M	1
Hildeaway Trailer Pk	166-08	320	4869		8	Prince Edward	Hallowell	SE	West	C	1
Hogans Haven	033-02	396	4924		8	Frontenac	Storrington	SE	Cranesnest	C	1
Iroquois APk	015-01	475	4965		9	Dundas	Iroquois	SE	St. Lawrence R	M	1
Kitley Twp Pk	082-12	419	4952		9	Leeds	Kitley	SE	Bellamys	M	1
Kring's Lodge	028-07	340	4978		8	Frontenac	Clarendon & Miller	SE	Sand	C	1
Kumalongway-Inn-Resort	063-09	278	5027		8	Hastings	Wilberforce	SE	Papineau	C	1
L. Doré Tent & Trailer Camp	181-11	333	5051		8	Renfrew	Bangor, W. & McC.	SE	Doré	C	2
L St. Peter PPk	062-01	733	5023		8	Hastings	Bangor, W. & McC.	SE	St. Peter	PPk	1
La Mure B	178-07	308	5108		8	Renfrew	Deep River	SE	Ottawa R	M	1
Lakeview Farms	061-02	306	4931		8	Hastings	Huntingdon	SE	Moira	C	1
Lancaster Pk	034-06	542	4999		9	Glengarry	Lancaster Twp	SE	St. Lawrence R	C	1
Laurentian View Cottages	181-03	352	5084		8	Renfrew	Westmeath	SE	Ottawa R	C	1
Lemkes Lodge	028-08	340	4978		8	Frontenac	Clarendon & Miller	SE	Sand	C	1
Lemoine Point CA	029-15	371	4898		8	Frontenac	Kingston Twp	SE	Ontario	CA	1
Levair Campsite	178-02	300	5057		8	Renfrew	Hagarty & Richards	SE	Round	C	1
Long L Cg	176-18	298	5032		8	Renfrew	Radcliffe	SE	Halfway	C	1
Long Sault Pkwy/Mille Roches	205-06	508	4985		9	Stormont	Osnabruck	SE	St. Lawrence R	PPk	3
Long Sault Pkwy/Woodlanda Pk	206-07	504	4982		9	Stormont	Osnabruck	SE	St. Lawrence R	PPk	3
Lutherlyn Camp	180-14	321	5048		8	Renfrew	South Algona	SE	Golden	Pr	1
L'Escale Camping and Marina	174-16	314	5052		8	Renfrew	North Algona	SE	Golden	C	1
MacLaren's Landing	127-03	408	5040		9	Ottawa-Carleton	West Carleton	SE	Ottawa R	C	1
Marble Point Resort	061-09	285	4930		8	Hastings	Marmora & Lake	SE	Crowe	C	1
McMillan's Cottages	175-01	319	5049		8	Renfrew	North Algona	SE	Golden	C	1
Mohawk B	063-(7	322	4894		9	Hastings	Tyendinaga IR	SE	Ontario	C	1
Mooney's Bay	126-03	446	5024		9	Ottawa-Carleton	Ottawa	SE	Rideau R	M	1
Morrisburg B & AP	015-02	486	4971		9	Dundas	Morrisburg	SE	St. Lawrence R	M	1
Nangor Resort	181-04	356	5082		8	Renfrew	Westmeath	SE	Ottawa R	C	1
North B PPk	167-03	297	4870		8	Prince Edward	Hillier	SE	Ontario	PPk	2
North Star Resort	178-14	304	5112		8	Renfrew	Rolph et al.	SE	Ottawa R	C	1
Old Forge Cottages	167-12	294	4874		8	Prince Edward	Hillier	SE	Ontario	C	1
Palmerston Canonto CA	032-12	357	4989		8	Frontenac	Palmerston et al.	SE	Canonto	CA	1
Petawawa Centennial Pk	175-10	323	5085		8	Renfrew	Petawawa V	SE	Petawawa R	M	1
Petawawa Point	175-11	325	5086		8	Renfrew	Petawawa V	SE	Ottawa R	M	1
Picnic-B Area	059-02	281	5022		8	Hastings	Bangor, W. & McC.	SE	Papineau	P	1
Pine Point B	178-09	306	5110		8	Renfrew	Deep River	SE	Ottawa R	M	1
Pinecrest Resort	032-10	399	4907		8	Frontenac	Pittsburgh	SE	St. Lawrence R	C	1
Pleasant Bay B	167-04	298	4869		8	Prince Edward	Hillier	SE	Ontario	P	1
Pt. Alexander Public Access	178-10	305	5111		8	Renfrew	Rolph et al.	SE	Ottawa R	M	1
Rideau Acres Cg	032-11	387	4906		8	Frontenac	Pittsburgh	SE	Cataraqui R	C	1
Rideau R PPk	126-08	446	4989		9	Ottawa-Carleton	Rideau	SE	Rideau R	PPk	2
Rider's Tent & Trailer Pk	027-15	370	4944		8	Frontenac	Bedford	SE	Bobs	C	1
Roblin L Pk	165-04	305	4881		8	Prince Edward	Ameliasburgh	SE	Roblin	M	1
Robiln L Pk		300	5057		8			SE	Round	C	1

NAME	WET	DRY	L.	U.A.	EFF. L.	TEMP.	LOC.	AES.	MON.	ZP. 86	ZP. 85	ZP. 84	ZP. X
Dunne's Resort	6	2	354	0	354	F	3						
Dupont of Canada Ltd.	3	4	1200	1	560	F	2					11%	4%
Edgewater Pk Trailer Camp	6	5	213	0	213	F	4						
Farran Pk	5	4	450	1	410	G	3		MNR				
Fitzroy PPk	2	4	458	0	458	G	4						
Flinton Pk	4	2	120	0	120	E	3						
Gardner's Lodge	6	3	117	0	117	G	3						
Gillies Bros. B	3	2	144	0	144	G	5						
Glengarry Pk	4	5	180	0	180	G	3						
Grass Cr Pk	3	3	110	0	110	F	4			11%		11%	16%
Hideaway Trailer Pk	2	2	488	1	418	F	4						
Hogans Haven	2	3	100	0	100	G	3						
Iroquois APk	3	2	127	0	127	G	4						
Kitley Twp Pk	4	4	110	0	110	G	4						
Kring's Lodge	4	2	300	0	300	G	5						
Kumalongway-Inn-Resort	5	3	200	0	200	P	6						
L Doré Tent & Trailer Camp	3	2	161	0	161	F	5		MNR				
L St. Peter PPk	3	4	120	0	120	P	3						
La Mure B	6	2	133	0	133	F	2						
Lakeview Farms	3	2	100	0	100	E	3						
Lancaster Pk	6	3	150	0	150	G	3						
Laurentian View Cottages	4	3	142	0	142	F	6						
Lemkes Lodge	5	2	175	0	175	G	5						
Lemoine Point CA	1	2	620	1	444	F	2					11%	4%
Levair Campsite	5	2	120	0	120	F	3						
Long L Cg	3	3	107	0	107	P	4						
Long Sault Pkwy/Mille Roches	5	4	350	0	350	G	3						
Long Sault Pkwy/Woodlanda Pk	5	5	639	0	639	G	3						
Lutherlyn Camp	5	2	448	0	448	F	4						
L'Escale Camping and Marina	1	6	421	1	404	F	4						
MacLaren's Landing	3	2	366	0	366	G	4						
Marble Point Resort	2	2	200	0	200	E	4						
McMillan's Cottages	4	4	134	0	134	F	4						
Mohawk B	3	3	550	1	430	F	4						
Mooney's Bay	4	2	275	0	275	G	1			67%		22%	
Morrisburg B & AP	5	5	110	0	110	G	2						
Nangor Resort	5	5	1020	1	524	F	6						
North B PPk	4	3	2440	1	1128	F	4		MNR				
North Star Resort	4	3	349	0	349	P	3						
Old Forge Cottages	4	2	216	0	216	F	5						
Palmerston Canonto CA	4	3	100	0	100	G	5						
Petawawa Centennial Pk	3	2	132	0	132	F	2						
Petawawa Point	4	4	500	1	420	F	2						
Picnic-B Area	3	5	110	0	110	P	3						
Pine Point B	6	5	240	0	240	F	3						
Pinecrest Resort	3	2	110	0	110	F	4						
Pleasant Bay B	5	3	804	1	481	F	3						
Pt. Alexander Public Access	5	3	400	1	400	F	3						
Rideau Acres Cg	5	4	101	0	100	G	4						
Rideau R PPk	4	3	549	0	549	G	4		MNR				
Rider's Tent & Trailer Pk	3	3	160	0	160	G	5						
Roblin I, Pk	5	2	130	0	130	G	4						
Round L Resort	5	3	200	0	200	F	3						

NAME	XREF	GRID X	GRID Y	D.	ZONE	COUNTY/REGION	MUNICIPALITY	MoE REG.	WATER BODY	ADMIN.	NO. B.
Ryans Campsite	178-16	303	5113		8	Renfrew	Rolph et al.	SE	Ottawa R	C	1
Sandbanks B Resort	166-15	318	4864		8	Prince Edward	Hallowell	SE	West	C	1
Sandbanks PPk	166-01	317	4864		8	Prince Edward	Hallowell	SE	Ontario	PPk	2
Sandy B Cottages	179-13	326	5037		8	Renfrew	Sebastopol	SE	Clear	C	1
Sandy Bay Cottages	077-04	406	4986		9	Lanark	Drummond	SE	Mississippi	C	1
Schooner L Public Access	030-10	343	4995		8	Frontenac	Clarendon & Miller	SE	Long Schooner	P	1
Spurr B Pk	060-01	276	4990		8	Hastings	Faraday	SE	Spurr	C	1
St. Lawrence B Resort	082-05	405	4907		9	Leeds	Front of L. & L.	SE	St. Lawrence R	C	1
Torbolton Forest	127-02	414	5039		9	Ottawa-Carleton	West Carleton	SE	Ottawa R	P	1
Tweed Memorial Pk	060-13	316	4927		8	Hastings	Tweed	SE	Stoco	M	1
Twp Pk - South Crosby	084-09	401	4937		9	Leeds	South Crosby	SE	Sand	M	1
T-Bell Resort	174-06	383	5023		8	Renfrew	McNab	SE	White	C	1
Undeveloped Big Sandy Bay Area	033-07	384	4885		8	Frontenac	Wolfe Island	SE	Ontario	P	1
Wadsworth L Public B	176-08	299	5033		8	Renfrew	Radcliffe	SE	Wadsworth	M	1
Woodcrest Pk	027-08	333	4964		8	Frontenac	Barrie Twp	SE	Kashwakamak	C	1
W.A. Taylor CA	126-02	451	4998		9	Ottawa-Carleton	Osgoode	SE	Rideau R	CA	1
York Farm Cottages	168-10	338	4870		8	Prince Edward	South Marysburgh	SE	Ontario	C	1
4 APt	072-09	391	4764		4	Lambton	Sarnia Twp	SW	Huron	P	1
6 APt	071-06	419	4784		4	Lambton	Bosanquet	SW	Huron	P	1
7 APt	071-07	420	4784		4	Lambton	Bosanquet	SW	Huron	P	1
9 APt	071-05	438	4796		4	Lambton	Grand Bend	SW	Huron	P	1
Ainslie Wood CA	039-05	510	4942		5	Grey	Sydenham	SW	Huron	CA	1
Amberley B APt	065-01	440	4878		4	Huron	Ashfield	SW	Huron	M	1
Ashfield Twp Pk	065-03	441	4874		4	Huron	Ashfield	SW	Huron	M	1
Baron de Tuyle Prop. APt	067-05	443	4820		4	Huron	Stanley	SW	Huron	P	1
Bathurst Amusements Ltd.	021-06	482	4723		4	Elgin	Port Stanley	SW	Erie	C	1
Bayfield B	067-09	443	4823		4	Huron	Bayfield	SW	Huron	M	1
Beatty Access	020-01	450	4206		4	Elgin	Aldborough	SW	Erie	P	1
Berford L APk	008-01	486	4963		5	Bruce	Albemarle	SW	Berford	M	1
Black Creek PPk Reserve	009-08	471	4979		5	Bruce	Eastnor	SW	Huron	P	1
Blue Anchor Trailer Pk	066-06	443	4824		4	Huron	Goderich Twp	SW	Huron	C	1
Blue Mountain Camp	037-05	555	4930		5	Grey	Collingwood Twp	SW	Huron	Pr	1
Blue Water B APk	008-15	489	4954		5	Bruce	Wiarton	SW	Huron	M	1
Bruce B	010 04	444	4885		4	Huron	Huron	SW	Huron	P	1
Bruce Twp Shoreline	009-07	458	4913		5	Bruce	Bruce	SW	Huron	M	1
Brucedale CA	009-06	458	4913		5	Bruce	Bruce	SW	Huron	CA	1
Bud & Barbs T & T Pk	038-12	548	4876		5	Grey	Proton	SW	Trib. of Grand R	C	1
Camp Canbay	066-12	443	4825		4	Huron	Goderich Twp	SW	Huron	Pr	1
Camp Menesetung	065-12	442	4849		4	Huron	Colborne Twp	SW	Huron	Pr	1
Canatara Pk APk	072-12	386	4762		4	Lambton	Sarnia C	SW	Huron	M	1
Cedar B	022-11	352	4652		4	Essex	Gosfield South	SW	Erie	P	1
Cedar Bay Trailer Pk	071-13	413	4776		4	Lambton	Bosanquet	SW	Huron	C	1
Circle R Ranch	095-02	468	4752		4	Middlesex	Delaware	SW	Dingman Cr	C	1
Colchester B Pk & Harbour	022-02	340	4649		4	Essex	Colchester South	SW	Erie	M	1
Con XI Public B	010-07	446	4888		4	Huron	Huron	SW	Huron	P	1
Con XII Public B	010-08	447	4889		5	Bruce	Huron	SW	Huron	P	1
Craigleith B Area	036-13	553	4931		5	Grey	Collingwood Twp	SW	Huron	M	1
C.M. Wilson CA	069-05	409	4692		4	Kent	Harwich	SW	unknown	CA	1
Dorcas Bay Pk APk	012-12	455	5004		5	Bruce	St. Edmunds	SW	Huron	P	1
Dover B Pk	069-01	184	4703		4	Kent	Dover	SW	St. Clair	PPk	1
Dunlop Road APt	065-06	442	4847		4	Huron	Colborne Twp	SW	Huron	M	1
East B Pk	024-04	365	4625		4	Essex	Pelee	SW	Erie	M	1
E...s B Pk	...01	46?	4919		5	Essex	Gee...	SW	Huron	M	1

NAME	WET	DRY	L.	U.A.	EFF. L.	TEMP.	LOC.	AES.	MON.	ZP. 86	ZP. 85	ZP. 84	ZP. X
Ryans Campsite	6	4	152	0	152	F	3	3					
Sandbanks B Resort	6	4	305	0	305	F	4	4	HNR				
Sandbanks PPk	5	5	2100	1	1060	F	3	3					
Sandy B Cottages	6	2	198	0	198	F	4	3					
Sandy Bay Cottages	5	6	100	0	100	G	4	6					
Schooner L Public Access	5	4	129	0	129	G	6	3					
Spurr B Pk	3	2	250	0	250	P	3	3					
St. Lawrence B Resort	4	4	125	0	125	G	3	5					
Torbolton Forest	6	2	610	1	442	G	5	5					
Tweed Memorial Pk	3	3	180	0	180	E	5	5					
Twp Pk - South Crosby	3	2	183	0	183	G	5	4					
T-Bell Resort	4	2	121	0	121	G	4	6					
Undeveloped Big Sandy Bay Area	3	3	700	1	460	F	6	4					
Wadsworth L Public B	5	2	168	0	168	G	4	5					
Woodcrest Pk	6	3	165	0	165	G	5	4					
W.A. Taylor CA	1	2	183	0	183	G	4	4					
York Farm Cottages	6	2	222	0	222	P	4	2					
4 APt	3	3	460	0	460	G	4	4					
6 APt	5	3	650	1	450	G	4	4					
7 APt	5	3	550	1	430	G	4	4					
9 APt	5	4	670	1	454	G	4	4					
Ainslie Wood CA	3	4	250	0	250	P	4	3					
Amberley B APt	2	5	183	0	183	P	3	3					
Ashfield Twp Pk	2	5	800	1	480	F	3	3					
Baron de Tuyle Prop. APt	2	2	800	1	480	G	3	3					
Bathurst Amusements Ltd.	4	6	400	1	400	G	3	2					
Bayfield B	1	2	1610	1	642	G	3	3					
Beatty Access	4	4	285	0	285	G	3	3					
Berford L APk	3	4	102	0	102	P	5	5					
Black Creek PPk Reserve	3	4	305	0	305	P	4	4					
Blue Anchor Trailer Pk	1	4	274	0	274	G	3	3					
Blue Mountain Camp	2	4	100	0	100	P	3	3					
Blue Water B APk	4	4	300	0	300	P	2	2					
Bruce B	2	2	800	1	480	P	4	4					
Bruce Twp Shoreline	3	3	9504	0	2221	F	5	5					
Brucedale CA	6	2	180	0	180	F	4	4					
Bud & Barbs T & T Pk	3	4	220	0	220	P	5	5					
Camp Canbay	2	4	400	0	400	G	3	3					
Camp Menesetung	2	2	183	0	183	F	3	3					
Canatara Pk APk	3	4	402	0	402	G	2	2					
Cedar B	5	4	144	0	144	E	3	3					
Cedar Bay Trailer Pk	6	4	450	1	410	E	4	4					
Circle R Ranch	2	2	274	0	274	E	3	3					
Colchester B Pk & Harbour	5	4	160	0	160	E	4	4				89%	
Con XI Public B	3	2	320	0	320	F	3	3					30%
Con XII Public B	2	2	1280	1	576	F	3	3					
Craigleith B Area	3	3	100	0	100	F	3	3					
C.M. Wilson CA	5	3	200	0	200	E	3	2					
Dorcas Bay Pk APk	6	3	152	0	152	P	4	3					
Dover B Pk	6	2	156	0	156	E	4	4					
Dunlop Road APt	2	2	800	1	480	F	3	3					
East B Pk	5	3	244	0	244	E	6	6					
Eldt's Grove B	4	3	241	0	241	F	4	4					

NAME	XREF	GRID X	GRID Y	D. ZONE	COUNTY/REGION	MUNICIPALITY	MoE REG.	WATER BODY	ADMIN.	NO. B.
Erie Woods Trailer Pk	020-03	446	4703	4	Elgin	Aldborough	SW	Erie	C	1
Erieau B	069-06	424	4679	4	Kent	Erieau	SW	Erie	M	1
Evergreen Resort	008-07	477	4958	5	Bruce	Albemarle	SW	Huron	C	2
Family Paradise Pk	067-04	479	4830	4	Huron	McKillop	SW	unknown	C	1
Fanshawe L CA	095-04	486	4767	4	Middlesex	London Twp	SW	Fanshawe	CA	1
Gobles Grove B	012-02	467	4919	5	Bruce	Saugeen	SW	Huron	M	1
Goderich B	066-05	442	4843	4	Huron	Goderich T	SW	Huron	M	1
Hay Sideroad 20 APt	067-06	442	4814	4	Huron	Stanley	SW	Huron	P	1
Hay-Stephen Twp Line APt	066-13	440	4798	4	Huron	Hay	SW	Huron	P	1
Hidden L Cottages	037-01	551	4931	5	Grey	Collingwood Twp	SW	Huron	C	1
Holiday B PPk	023-08	332	4655	4	Essex	Malden	SW	Erie	PPk	1
Holliday Harbour Rec Resort	070-04	380	4659	4	Kent	Romney	SW	Erie	C	1
Huron Church Camp	067-11	443	4819	4	Huron	Stanley	SW	Huron	Pr	1
Huron Ridge	010-13	449	4893	5	Bruce	Kincardine T	SW	Huron	M	1
Huron View Pk APk	072-13	396	4765	4	Lambton	Sarnia Twp	SW	Huron	M	1
Inverhuron PPk	009-05	453	4905	5	Bruce	Bruce	SW	Huron	PPk	1
Ipperwash B APt "A"	071-01	420	4784	4	Lambton	Bosanquet	SW	Huron	P	1
Ipperwash B APt "B"	071-02	420	4784	4	Lambton	Bosanquet	SW	Huron	P	1
Ipperwash B APt "C"	071-03	421	4784	4	Lambton	Bosanquet	SW	Huron	P	1
Ipperwash B APt "E"	071-04	421	4784	4	Lambton	Bosanquet	SW	Huron	P	1
Ipperwash B APt "G"	071-12	422	4785	4	Lambton	Bosanquet	SW	Huron	P	1
Ipperwash PPk	071-08	423	4785	4	Lambton	Bosanquet	SW	Huron	PPk	2
Iroquois B PPk	020-06	515	4722	4	Elgin	Port Burwell	SW	Erie	PPk	1
Kelso B APk	038-06	504	4936	5	Grey	Owen Sound	SW	Huron	M	1
Kent County Pk	069-09	432	4690	4	Kent	Howard	SW	Erie	M	1
Kenwood Cottages	037-02	541	4937	5	Grey	Collingwood Twp	SW	Huron	C	1
Kitchigami Camp	066-08	442	4834	4	Huron	Goderich Twp	SW	Huron	CA	2
L.Whittaker CA	095-06	504	4751	4	Middlesex	North Dorchester	SW	Whittaker	CA	1
Lakeside Summer Resort	128-10	498	4782	4	Oxford	Zorra	SW	Sunova	C	1
Lambton United Church Centre	071-21	416	4679	4	Lambton	Bosanquet	SW	Huron	Pr	1
Lansdowne Pk	010-15	449	4891	5	Bruce	Kincardine T	SW	Huron	M	1
Linden B B	022-16	354	4653	4	Essex	Gosfield South	SW	Erie	Pr	1
Lion's Head B APk	009-10	480	4982	5	Bruce	Lion's Head	SW	Huron	M	1
Lurgan B	010-12	441	4883	5	Bruce	Huron	SW	Huron	P	1
MacGregor Point PPk	011-12	462	4918	5	Bruce	Saugeen	SW	Huron	PPk	1
Memorial Pk APk	038-09	533	4939	5	Grey	Meaford	SW	Huron	M	1
Mersea Centennial	023-15	370	4652	4	Essex	Mersea	SW	Erie	M	1
Miramichi B	012-03	469	4924	5	Bruce	Saugeen	SW	Huron	M	1
Natural B APk	012-04	470	4927	5	Bruce	Saugeen	SW	Huron	M	1
Norwich CA	128-06	532	4760	4	Oxford	Norwich	SW	Otter Cr	CA	1
N. Sauble B APk	008-16	478	4943	5	Bruce	Amabel	SW	Huron	M	1
Orchard View Pk Enterprises	071-15	413	4776	4	Lambton	Bosanquet	SW	Huron	C	1
Parkside Trailer Pk	071-16	422	4785	4	Lambton	Bosanquet	SW	Huron	C	1
Paul Bunyan Cg	067-10	443	4822	4	Huron	Bayfield	SW	Huron	C	1
Pine R Public B	010-09	440	4882	5	Bruce	Huron	SW	Huron	P	1
Pinery PPk	071-09	430	4788	4	Lambton	Bosanquet	SW	Huron	PPk	2
Pioneer Pk	039-04	511	4909	5	Grey	Sullivan	SW	unknown	C	1
Point Clark B	010-05	439	4880	5	Bruce	Huron	SW	Huron	P	1
Point Pelee NPk	023-11	373	4648	4	Essex	Mersea	SW	Erie	NPk	6
Polska Plaza H A	022-08	336	4652	4	Essex	Colchester South	SW	Erie	Pr	1
Port Blake CA	067-12	440	4798	4	Huron	Stephen	SW	Huron	CA	1
Port Bruce PPk	020-11	499	4722	4	Elgin	Malahide	SW	Erie	PPk	1
Port Elgin	012-05	463	492?	5	Bruce	Port Elgin	SW	Huron	M	1

NAME	WET	DRY	L.	U.A.	EFF. L.	TEMP.	LOC.	AES.	HON.	ZP. 86	ZP. 85	ZP. 84	ZP. X
										22%			7%
Erie Woods Trailer Pk	2	4	275	0	275	G	3						
Erieau B	4	4	576	1	435	G	4						
Evergreen Resort	5	2	242	0	242	P	4						
Family Paradise Pk	4	2	150	0	150	E	6						
Fanshawe L. CA	2	3	122	0	122	E	2						
Gobles Grove B	4	3	201	0	201	F	3						
Goderich B	3	6	151	0	151	F	2						
Hay Sideroad 20 APt	2	3	800	1	480	G	3						
Hay-Stephen Twp Line APt	2	3	500	1	420	G	3						
Hilden L. Cottages	3	2	300	0	300	F	3						
Holiday B PPk	4	4	549	1	430	E	4		MNR				
Holiday Harbour Rec Resort	3	4	215	0	215	E	3						
Huron Church Camp	2	2	430	1	406	G	3						
Huron Ridge	2	2	1110	0	1110	F	3						
Huron View Pk APk	1	2	304	0	304	G	4		MNR				
Inverhuron PPk	5	2	182	1	182	P	4						
Ipperwash B APt "A"	5	4	996	1	519	G	4						
Ipperwash B APt "B"	5	4	871	1	494	G	4						
Ipperwash B APt "C"	5	4	853	1	491	G	4						
Ipperwash B APt "E"	5	4	1112	1	542	G	4						
Ipperwash B APt "G"	5	4	400	1	400	G	4						
Ipperwash PPk	5	3	369	0	369	G	4		MNR				
Iroquois B PPk	3	5	900	0	500	G	4		MNR				
Kelso B APk	5	2	270	0	270	P	2						
Kent County Pk	5	3	324	0	324	G	3						
Kenwood Cottages	3	3	100	0	100	P	3						
Kitchigami Camp	4	3	188	0	188	P	4						
L Whittaker CA	1	2	274	0	274	E	4						
Lakeside Summer Resort	5	3	303	0	303	E	4						
Lambton United Church Centre	5	3	130	0	130	G	4						
Lansdowne Pk	2	3	240	0	240	F	2						
Linden B B	6	3	245	0	245	E	4						
Lion's Head B APk	3	2	152	0	152	P	4						
Lurgan B	4	3	1360	1	592	P	5		MNR				
MacGregor Point PPk	3	4	480	1	416	F	5						
Memorial Pk APk	3	4	130	0	130	P	2						
Mersea Centennial	5	3	131	0	131	E	5						
Miramichi B	2	2	529	1	426	E	2						
Natural B APk	5	4	2280	0	2280	P	4		MNR				
Norwich CA	2	4	150	0	150	E	2						
N. Sauble B APk	5	4	3845	1	1089	F	4						
Orchard View Pk Enterprises	5	2	183	0	183	G	4						
Parkside Trailer Pk	6	3	200	0	200	E	4						
Paul Bunyan CB	2	2	263	0	263	G	3						
Pine R Public B	4	2	400	1	400	F	3						
Pinery PPk	5	3	7000	1	2040	G	3		MNR				
Pioneer Pk	3	3	350	0	350	G	3						
Point Clark B	5	3	400	1	400	F	4						
Point Pelee NPk	4	3	6452	1	3210	E	4						
Polska Plaza II A	5	4	110	0	110	E	4						
Port Blake CA	2	2	182	0	182	G	3						
Port Bruce PPk	4	5	600	1	440	G	3		MNR				
Port Elgin B	6	4	373	0	373	F	2						
												11%	4%

NAME	XREF	GRID X	GRID Y D.	ZONE	COUNTY/REGION	MUNICIPALITY	MoE REG.	WATER BODY	ADMIN.	NO. B.
Port Stanley CA	021-03	481	4723	4	Elgin	Port Stanley	SW	Erie	CA	1
Queen's Bush B	012-06	467	4920	5	Bruce	Saugeen	SW	Huron	M	1
Red Bay Municipal Pk	008-03	477	4961	5	Bruce	Albemarle	SW	Huron	M	1
Regatta Bay Access	008-14	478	4951	5	Bruce	Amabel	SW	Huron	M	1
Rondeau PPk	069-02	430	4681	4	Kent	Harwich	SW	Erie	PPk	3
R. Macdonald's T & T Pk	011-09	467	4991	5	Bruce	Lindsay Twp	SW	Miller?	C	1
Sand Point Pk	024-11	342	4689	4	Essex	Windsor	SW	St. Clair	M	1
Sarnia Centennial Pk	073-02	385	4760	4	Lambton	Sarnia C	SW	St. Clair R	CA	1
Sarnia Riding Club	073-06	387	4763	4	Lambton	Sarnia C	SW	Huron	PPk	1
Sauble B Indian Pk	009-01	478	4939	5	Bruce	Saugeen IR	SW	Huron	Pr	1
Saugeen B	012-07	466	4919	5	Bruce	Saugeen	SW	Huron	M	1
Saugeen Cedars	036-07	504	4889	5	Grey	Bentinck	SW	Camp Cr	C	1
Seacliffe Pk	023-16	367	4654	4	Essex	Leamington	SW	Erie	M	1
Sheppardton Road APt	065-07	442	4855	4	Huron	Colborne Twp	SW	Huron	M	1
South B	011-02	448	4890	5	Bruce	Kincardine T	SW	Huron	P	1
South Bruce B	010-11	442	4884	5	Bruce	Huron	SW	Huron	M	1
Southampton B APk	011-13	470	4928	5	Bruce	Southampton	SW	Huron	M	1
Springwater CA & Tract	020-12	498	4732	4	Elgin	Malahide	SW	unknown	CA	1
Stanley Sideroad 15 APt	067-07	442	4816	4	Huron	Stanley	SW	Huron	P	1
Station B	011-03	449	4891	5	Bruce	Kincardine T	SW	Huron	M	1
Stephen's Cottages	037-12	556	4930	5	Grey	Collingwood Twp	SW	Huron	C	1
St. Josephs B APt	066-14	442	4807	4	Huron	Hay	SW	Huron	M	1
Sunnyside B Cottages	039-01	530	4945	5	Grey	St. Vincent	SW	Huron	C	1
Thedford CA	071-11	430	4786	4	Lambton	Bosanquet	SW	unknown	CA	1
Trout L Pk	128-05	525	4783	4	Oxford	E. Zorra-Tavistock	SW	Thames R	C	1
Tyrolean Village Resort	037-04	554	4929	5	Grey	Collingwood Twp	SW	Huron	C	1
Union Sideroad B APt	066-02	442	4836	4	Huron	Goderich Twp	SW	Huron	P	1
Varney CA	038-04	515	4887	5	Grey	Normanby	SW	Trib. of Camp Cr	CA	1
W D Ranch	037-12	527	4896	5	Grey	Glenelg	SW	Saugeen R	C	1
Warwick CA	073-05	423	4761	4	Lambton	Warwick	SW	Bear Cr	CA	1
Wees B Access	073-04	387	4763	4	Lambton	Sarnia C	SW	Huron	Pr	1
Wheatley PPk	070-01	380	4660	4	Kent	Romney	SW	Erie	PPk	1
Wildwood CA	152-02	494	4790	4	Perth	Downie	SW	Wildwood	CA	1
Wildwood Lodge Ltd.	008- 1	477	4960	5	Bruce	Albemarle	SW	Huron	C	1
Wildwood Pk	073-03	396	4765	4	Lambton	Sarnia Twp	SW	Huron	M	1
Willow B	023-10	327	4656	4	Essex	Malden	SW	Erie	P	1
Willow B Pk Walpole Is	073-09	376	4720	4	Lambton	Walpole Island IR	SW	St. Clair R	CA	1
Woodrow B Access	073-05	386	4762	4	Lambton	Sarnia C	SW	Huron	C	1
Barber's B	219-05	559	4808	4	Wellington	Puslinch	WC	Puslinch	Pr	1
Bay Beach Corporation	113-07	657	4747	3	Niagara	Fort Erie	WC	Erie	Pr	1
Binbrook Dam & CA	058-01	593	4773	3	Hamilton-Wentworth	Glanbrook	WC	Niagenco	CA	1
Bingeman Pk	216-02	544	4813	4	Waterloo	Kitchener	WC	Grand R	Pr	1
Blue Springs Recreation Area	216-03	546	4813	4	Waterloo	Kitchener	WC	Grand R	C	1
Buffalo Canoe Club	113-10	656	4746	3	Niagara	Fort Erie	WC	Erie	Pr	1
Chippawa Cr CA	115-08	621	4760	3	Niagara	Walnfleet	WC	Welland R	CA	1
Christie CA	057-06	580	4792	3	Hamilton-Wentworth	Flamborough	WC	Spencer Cr	CA	1
Club La Salle	115-07	643	4786	3	Niagara	St. Catharines	WC	Ontario	Pr	1
Conestogo Bible Camp	218-06	523	4839	4	Wellington	Maryborough	WC	Conestogo	Pr	1
Confederation Pk APk	058-02	601	4789	3	Hamilton-Wentworth	Hamilton C	WC	Ontario	M	1
Copetown Holiday Pk l.td.	057-01	577	4788	3	Hamilton-Wentworth	Ancaster	WC	unknown	C	1
Country Gardens C_R	217-01	536	4803	4	Waterloo	Wilmot	WC	Alder Cr?	C	1
Courtcliffe Pk	057-03	582	4804	3	Hamilton-Wentworth	Flamborough	WC	Bronte Cr	C	1
Crystal B Pk	113-08	658	4747	3	Niagara	Fort Erie	WC	Erie	C	1

NAME	WET	DRY	L.	U.A.	EFF. L.	TEMP.	LOC.	AES.	MON.	ZP. 86	ZP. 85	ZP. 84	ZP. X
Port Stanley CA	2	4	240	0	240	G	3	3					
Queen's Bush B	5	3	106	0	106	P	3	3					
Red Bay Municipal Pk	5	3	135	0	135	P	4	4					
Regatta Bay Access	5	4	165	1	165	P	4	4	MNR				
Rondeau PPk	1	4	3209	1	1602	G	3	3					
R. Macdonald's T & T Pk	3	4	122	0	122	P	1	1					
Sand Point Pk	3	2	100	0	100	E	2	2					
Sarnia Centennial Pk	3	3	145	0	145	G	2	2				11%	4%
Sarnia Riding Club	5	2	108	0	108	G	2	2					
Sauble B Indian Pk	4	2	7010	0	1722	P	3	3					
Saugeen B	6	2	3219	1	964	F	3	3					
Saugeen Cedars	3	2	1000	1	520	G	3	3					
Seacliffe Pk	6	3	185	1	185	E	3	3					
Sheppardton Road Apt	2	2	400	1	400	F	2	2					
South B	6	2	1051	1	530	F	3	3					
South Bruce B	5	2	1840	1	688	F	2	2					
Southampton B APk	3	4	792	0	792	F	2	2					
Springwater CA & Tract	2	2	150	1	150	E	4	4					
Stanley Sideroad 15 APt	2	3	800	1	480	G	2	2					
Station B	3	2	554	0	554	F	3	3					
Stephen's Cottages	2	4	100	0	100	F	3	3					
St. Josephs B APt	2	2	800	1	480	G	5	5					
Sunnyside B Cottages	2	2	175	0	175	P	3	3					
Thedford CA	2	2	305	0	305	E	4	4					
Trout L Pk	3	2	1200	1	560	F	3	3					
Tyrolean Village Resort	4	6	330	0	330	F	3	3					
Union Sideroad B Aft	2	4	800	1	480	F	3	3					
Varney CA	3	4	140	0	140	F	3	3					
W D Ranch	3	4	100	0	100	F	4	4					
Warwick CA	2	2	128	0	128	E	2	2					
Wees B Access	4	3	800	1	480	G	3	3					
Wheatley PPk	2	5	2100	0	740	E	2	4					
Wildwood CA	4	5	150	0	150	E	2	3					
Wildwood Lodge Ltd.	6	3	183	0	183	E	4	4					
Wildwood Pk	4	3	182	1	182	G	3	3					
Willow B	6	3	400	0	400	E	3	3	MNR				
Willow B Pk Walpole Is	4	3	123	1	123	E	4	4				11%	4%
Woodrow B Access	4	3	400	0	400	G	4	4					
Barber's B	2	5	112	0	112	G	4	4					
Bay Beach Corporation	4	3	152	1	152	G	1	1					
Binbrook Dam & CA	2	3	107	0	107	E	4	4					
Bingeman Pk	2	3	366	0	366	E	4	4					
Blue Springs Recreation Area	4	3	250	0	250	G	3	3					
Buffalo Canoe Club	6	1	137	0	137	G	4	4					
Chippawa Cr CA	2	2	135	0	135	E	3	3					
Christie CA	3	5	366	0	366	G	4	4					
Club La Salle	5	3	380	0	380	G	4	4					
Conestogo Bible Camp	2	3	100	0	100	G	4	4					
Confederation Pk APk	3	6	3219	1	964	P	1	1					
Copetown Holiday Pk Ltd.	4	5	147	1	147	E	4	4		41%			
Country Gardens Cg	4	5	105	0	305	E	3	3			50%		
Courtcliffe Pk	1	2	122	0	122	E	3	3				100%	10%
Crystal B Pk	5	1	229	0	229	G	4	4					11%

NAME	XREF	GRID X	GRID Y	D. ZONE	COUNTY/REGION	MUNICIPALITY	MoE REG.	WATER BODY	ADMIN.	NO. B.
Guelph Recreational Pk	218-04	556	4826	4	Wellington	Guelph Twp	WC	Marden Cr	M	1
Gulliver's L & Pk	057-09	579	4801	3	Hamilton-Wentworth	Flamborough	WC	Trib. of Sp'r Cr?	C	1
Hamilton B	058-03	599	4792	3	Hamilton-Wentworth	Hamilton C	WC	Ontario	M	1
Hillside L Pk	216-05	550	4792	4	Waterloo	North Dumfries	WC	unknown	C	1
Humberstone Centennial Pk	114-12	648	4748	3	Niagara	Port Colborne	WC	Erie	M	1
Jones B	115-05	645	4787	3	Niagara	St. Catharines	WC	Ontario	C	1
Knight's B	041-01	602	4743	4	Haldimand-Norfolk	Haldimand T	WC	Erie	C	1
Knight's Dunmark Pk	057-02	573	4782	3	Hamilton-Wentworth	Ancaster	WC	Dunmark	M	1
Lakeside Pk APk	115-03	641	4785	3	Niagara	St. Catharines	WC	Ontario	CA	1
Long Beach CA	115-09	629	4748	3	Niagara	Wainfleet	WC	Erie	C	1
Mint Valley B Pk	217-03	522	4802	4	Waterloo	Wilmot	WC	Nith R	M	1
Municipal B	115-04	644	4786	3	Niagara	St. Catharines	WC	Ontario	M	1
Nelles Road APt	113-11	620	4783	3	Niagara	Grimsby	WC	Trib. of Nott'ga R?	C	1
New Hockley Hills Hotel 1977	014-03	577	4869	4	Dufferin	Mono	WC	Erie	CA	1
Nickel B	114-13	644	4748	3	Niagara	Port Colborne	WC	Erie	CA	1
Norfolk B	041-06	560	4733	4	Haldimand-Norfolk	Nanticoke	WC	Pinehurst	CA	1
Pinehurst CA	007-06	549	4791	4	Brant	South Dumfries	WC	Ontario	Pr	1
Place Polonaise	113-13	612	4786	3	Niagara	Grimsby	WC	Erie	M	1
Port Dover Main B	041-08	565	4737	4	Haldimand-Norfolk	Nanticoke	WC	Ontario	M	1
Queen's Royal Pk APk	114-01	656	4791	3	Niagara	Niagara-on-the-Lake	WC	Erie	M	1
Sand Hill Pk	041-14	529	4715	4	Haldimand-Norfolk	Norfolk	WC	unknown	C	1
Schneider's Pk B	217-04	537	4803	4	Waterloo	Wilmot	WC	Galt Cr	C	1
Shade's Hills CA	216-01	558	4803	4	Waterloo	Cambridge C	WC	Erie	CA	1
Sherkston Beaches Ltd	115-01	652	4748	3	Niagara	Port Colborne	WC	Nith R	C	2
Sun Valley B Pk	217-05	524	4807	4	Waterloo	Wilmot	WC	Grand R	C	1
Sunnibank Pk	040-13	605	4753	4	Haldimand-Norfolk	Dunnville	WC	Erie	PPk	1
Turkey Point Ppk	040-02	555	4727	4	Haldimand-Norfolk	Delhi	WC	Valens	CA	1
Valens CA	057-07	569	4804	3	Hamilton-Wentworth	Flamborough	WC	Erie	CA	2
Waterford CA	041-07	555	4753	4	Haldimand-Norfolk	Nanticoke	WC	unknown	CA	2

NAME	WET	DRY	L.	U.A.	EFF. L.	TEMP.	LOC.	AES.	MON.	ZP. 86	ZP. 85	ZP. 84	ZP. X
Guelph Recreational Pk	4	4	229	0	229	E		3					
Gulliver's L. & Pk	1	4	792	1	478	E		4					
Hamilton B	4	2	4185	0	4185	P		1					
Hillside L. Pk	2	2	158	0	158	E		3					
Humberstone Centennial Pk	5	5	300	0	300	G		3				22%	7%
Jones B	4	5	228	0	228	G		1				22%	7%
Knight's B	4	3	805	1	481	G		3					
Knight's Dunmark Pk	5	5	117	0	117	E		1					
Lakeside Pk APk	6	5	366	0	366	G		4		100%	100%	100%	100%
Long Beach CA	5	3	610	1	442	G		3					
Mint Valley B Pk	5	3	183	0	183	G		1					
Municipal B	5	6	366	0	366	G		3		100%	100%	100%	100%
Nelles Road APt	3	3	242	0	242	F		2					
New Hockley Hills Hotel 1977	5	4	150	0	150	F		4					
Nickel B	4	6	1600	1	640	G		2				22%	7%
Norfolk CA	4	2	447	1	409	E		3					
Pinehurst CA	3	2	100	0	100	E		3					
Place Polonaise	4	2	424	1	405	F		2					
Port Dover Main B	5	4	503	0	503	G		2					
Queen's Royal Pk APk	4	6	122	0	122	G		4					
Sand Hill Pk	2	4	668	1	454	G		1					
Schneider's Pk B	3	5	330	0	330	E		4					
Shade's Hills CA	4	6	213	0	213	E		4					
Sherkston Beaches Ltd	6	4	5210	1	1682	G		4					
Sun Valley B Pk	2	2	580	0	183	E		2					
Sunnibank Pk	4	3	183	1	803	G	MNR	3					
Turkey Point PPk	3	5	2414	0	198	E		3					
Valens CA	3	4	198	1	823	E		3					
Waterford CA	3	4	915	1		E		3					

APPENDIX 4
EXCLUDED BEACHES IN MAJOR URBAN CENTRES

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Notes: This table includes Ontario Recreation Supply Inventory beaches that are located in an urban municipality with a
population of 50,000 or more, and inside or adjacent to that municipality's urbanized area, but which were
excluded from the beach list (Appendix 3).
An asterisk at the end of a site name means that some beaches at that site are included in the beach list. The
information in this table pertains only to the excluded beaches at such sites.
An asterisk at the end of the municipality name means that some beaches in the municipality are included in the
beach list.
By definition, all sites on this list have a location code (LOC.) of 1.
No information on the agency monitoring water quality (MON.) is available for beaches on this list.
For further information on the data fields, see Appendix 6, section A6.1; for further information on the exclusion
criteria, see Section 3.
Exclusion criteria 4 and 5 do not apply to any of the beaches on this list.

MUNICIPALITY/SITE NAME	XREF	GRID X	GRID Y	D. ZONE	COUNTY/REGION	Mo8 REG.	WATER BODY	ADMIN.	NO. B.
BRAMPTON*									
Heart L. CA	150-02	597	4844	3	Peel	C	Heart	CA	1
BRANTFORD C - nil									
BURLINGTON									
Burlington Supervised B	055-01	597	4796	3	Halton	C	Ontario	M	1
CAMBRIDGE C* - nil									
GLOUCESTER - nil									
GUELPH C									
Riverside Pk	218-05	559	4823	4	Wellington	WC	Speed R	M	1
HAMILTON C* - nil									
KINGSTON C									
Belles Island Pk	030-01	383	4900	8	Frontenac	SE	Ontario	M	1
Cataraqui Bay Marina	030-03	377	4897	8	Frontenac	SE	Ontario	C	1
L Ontario Pk APk	029-17	378	4897	8	Frontenac	SE	Ontario	M	1
Macdonald Pk	030-02	381	4897	8	Frontenac	SE	Ontario	M	1
KITCHENER* - nil									
LONDON C - nil									
MARKHAM* - nil									
METROPOLITAN TORONTO*									
Amos Waites Pk	094-02	622	4829	2	Metro. Toronto	C	Ontario	M	1
Ashbridge's Bay Pk*	094-04	636	4835	2	Metro. Toronto	C	Ontario	M	2
Beaches Pk	094-06	636	4835	2	Metro. Toronto	C	Ontario		1

MUNICIPALITY/SITE NAME	WET	DRY	L.	U.A.	EFF. L.	TEMP.	%P. 86	%P. 85	%P. 84	%P. X	NO. B. EXCLUDED FOR CRITERIA 1	2	3
BRAMPTON*													
Heart L. CA	2	4	75		75	E					1		1
BRANTFORD C - nil													
BURLINGTON													
Burlington Supervised B	3	3	61		61	P							1
CAMBRIDGE C* - nil													
GLOUCESTER - nil													
GUELPH C													
Riverside Pk	3	1	70		70	E						1	
HAMILTON C* - nil													
KINGSTON C													
Belles Island Pk	4	4	30		30	F	11%	25%		12%			1
Cataraqui Bay Marina	3	2	40		40	F	11%	50%	11%	24%			1
L. Ontario Pk APk	2	4	144		144	F	67%	50%		39%	1		
Macdonald Pk	3	3	30		30	P							1
KITCHENER* - nil													
LONDON C - nil													
MARKHAM* - nil													
METROPOLITAN TORONTO*													
Amos Waites Pk	4	3	70		70	P	100%	100%	67%	89%	2		1
Ashbridge's Bay Pk*	1	2	164		164	P	67%	50%		39%	1		2
Beaches Pk	3	4	1500		1500	P	67%	50%	56%	58%	1		
Bluffer's Pk	3	3	91		91	P	22%			7%			

MUNICIPALITY/SITE NAME	XREF	GRID X	GRID Y	D. ZONE	COUNTY/REGION	MoE REG.	WATER BODY	ADMIN.	NO. B.
Budapest Pk	094-07	624	4832	2	Metro. Toronto	C	Ontario	M	1
Cherry B Pk	094-08	633	4832	2	Metro. Toronto	C	Ontario	M	1
Lakeshore Pk	094-09	626	4831	2	Metro. Toronto	C	Ontario	M	1
MISSISSAUGA*									
Richard's Memorial Pk	150-12	613	4821	3	Peel	C	Ontario	M	1
NEPEAN - nil									
NIAGARA FALLS									
Greater Niagara Boating Club	113-14	657	4768	3	Niagara	WC	Welland R	Pr	1
King's Bridge Pk	113-15	658	4769	3	Niagara	WC	Welland R	PPk	1
NORTH BAY - outside ORSI coverage area									
OAKVILLE									
Bronte B Pk	055-09	604	4805	3	Halton	C	Ontario	M	1
Coronation Pk	055-10	606	4806	3	Halton	C	Ontario	M	1
Wateska Dedication	055-11	611	4814	3	Halton	C	Ontario	M	1
OSHAWA*									
Stone Street Pk	017-07	673	4858	3	Durham	C	Ontario	M	1
OTTAWA*									
Brantwood Pk	126-06	447	5028	9	Ottawa-Carleton	SE	Rideau R	M	1
Remic B	126-04	442	5028	9	Ottawa-Carleton	SE	Ottawa R	M	1
Westboro B	126-05	440	5027	9	Ottawa-Carleton	SE	Ottawa R	M	1
PETERBOROUGH*									
Newhall Pk	161-C1	714	4907	8	Peterborough	C	Otonabee R	M	1
Wenonah Motel	161-03	715	4914	8	Peterborough	C	Otonabee R	C	1
ST. CATHARINES*									
Michigan B	114-06	641	4785	3	Niagara	WC	Ontario	C	1
SAULT STE. MARIE - outside ORSI coverage area									
SUDBURY - ORSI coverage may be incomplete									
Idylwylde Golf & Country Club	207-04	501	5145	1	Sudbury R.M.	NE	Nepahwin	Pr	1
THUNDER BAY - outside ORSI coverage area; all beach sites would be excluded under criterion 4									
VAUGHAN									
Boyd CA	225-04	614	4852	3	York	C	Humber R	CA	1
WATERLOO									
Laurel Gr CA	216-06	534	4814	4	Waterloo	WC	Laurel Gr	CA	1
WINDSOR*									
Pk		129	86	4 East			olt		

HUNICIPALITY/SITE NAME	WET	DRY	L.	U.A. EFF. L.	TEMP.	ZP. 86	ZP. 85	ZP. 84	ZP. X	1	2	3
Budapest Pk	2	5	330	330 P		78%	100%	67%	82%	1		
Cherry B Pk	2	4	606	606 P		22%			7%	1		
Lakeshore Pk	3	3	210	210 P		78%	100%	67%	82%	1		
MISSISSAUGA*												
Richard's Memorial Pk	3	5	26	26 P		22%		11%	11%	1		
NEPEAN - nil												
NIAGARA FALLS												
Greater Niagara Boating Club	1	2	61	61 E								1
King's Bridge Pk	3	3	91	91 E						1		1
NORTH BAY - outside ORSI coverage ar												
OAKVILLE												
Bronte B Pk	3	2	58	58 P		28%	75%		34%			1
Coronation Pk	3	1	366	366 P		56%	50%		35%		1	1
Wateska Dedication	3	1	46	46 P							1	1
OSHAWA*												
Stone Street Pk	5	4	91	91 P						1		1
OTTAWA*												
Brantwood Pk	1	3	57	57 G		11%	50%	100%	54%			
Remic B	1	3	39	39 G						1		
Westboro B	2	4	127	127 G		22%		67%	30%	1		
PETERBOROUGH*												
Newhall Pk	1	1	18	18 E		100%	100%		67%	1		
Wenonah Hotel	3	3	7	7 E						1		
ST. CATHARINES*												
Michigan B	5	3	80	80 G		100%	100%	100%	100%	1		
SAULT STE. MARIE - outside ORSI cove												
SUDBURY - ORSI coverage may be incom												
Idylwylde Golf & Country Club	3	1	21	21 F						1		
THUNDER BAY - outside ORSI coverage												
VAUGHAN*												
Boyd CA	5	6	255	255 E				100%	33%	1		
WATERLOO												
Laurel Cr CA	1	6	91	91 G			25%	11%	12%	1		
WINDSOR*												
McKee B	3	1	81	81 E							1	1
Stop 26 B	3	2	51	51 E							1	1

A5.1 Population and Participation by Origin Zone

AGE GROUP	0-11	12-19	20-34	35-49	50-64	65+	TOTAL
OCC/PER	32.0	41.2	22.0	16.9	10.9	2.1	
Kenora	14	10	15	9	7	4	59
Rainy R.	4	4	5	4	4	3	23
T. Bay	28	22	42	25	23	15	154
NW ONT	46	35	62	38	34	22	236
Occ/Per	32	41	22	17	11	2	
RPF=	0.99						
Algoma	26	21	35	23	18	10	134
Cochrane	20	16	25	16	13	8	97
Manitoul.	2	2	2	2	2	2	11
Nipissing	15	13	19	14	12	8	80
Sudbury	37	31	46	33	26	13	187
Timisk.	8	7	9	7	6	5	41
NE ONT	108	90	137	94	76	45	550
Occ/Per	31	40	22	17	11	2	
RPF=	0.98						
METRO TOR	309	269	596	394	343	226	2137
Occ/Per	30	39	21	16	10	2	
RPF=	0.94						
Durham	56	42	75	53	36	21	284
Halton	46	39	62	53	36	18	254
Hamilton	66	56	105	71	67	45	411
Niagara	62	54	86	64	60	42	368
Peel	102	72	139	100	54	23	491
York	48	37	64	51	33	19	252
GOLDEN H	381	300	532	393	286	168	2060
Occ/Per	34	43	23	18	11	2	
RPF=	1.05						
Hald-Nor.	16	13	21	15	13	11	90
Waterloo	57	44	83	53	41	27	306
Brant	19	15	26	17	16	12	104
Dufferin	6	5	7	6	4	3	31
Elgin	13	10	16	12	10	9	70
Essex	56	46	77	53	46	35	313
Huron	10	8	12	9	8	8	56
Kent	20	16	26	17	15	13	107
Lambton	23	18	31	21	18	12	123
Middlesex	54	44	88	55	46	33	318
Oxford	16	13	21	14	13	11	86
Perth	12	10	16	10	10	9	66

AGE GROUP	0-11	12-19	20-34	35-49	50-64	65+	TOTAL
Wellingt.	24	19	33	22	18	14	129
SW ONT	327	259	457	304	258	195	1799
Occ/Per	30	38	20	16	10	2	
RPF=	0.93						
Muskoka	6	5	8	6	7	6	38
Parry Sd.	5	5	7	6	6	5	34
Bruce	12	8	14	10	8	8	60
Grey	13	10	16	12	11	11	74
Haliburt.	2	1	2	2	2	2	11
Simcoe	41	33	54	39	32	26	225
GEORGIAN	79	63	102	74	66	58	442
Occ/Per	33	42	22	17	11	2	
RPF=	1.02						
Frontenac	17	15	29	19	16	12	108
Hastings	19	16	25	18	17	12	107
Len.&Add.	6	5	8	6	5	4	33
Northumb.	11	9	14	11	11	9	65
Peterbor.	17	14	24	17	17	13	103
Pr.Edward	4	3	5	4	4	3	22
Renfrew	15	13	21	14	13	10	88
Victoria	8	6	10	8	8	8	48
EAST ONT	97	83	137	96	90	71	573
Occ/Per	35	44	24	18	12	2	
RPF=	1.08						
Ottawa	86	75	157	102	80	49	547
Lanark	8	6	11	7	7	6	46
Leeds	9	8	12	9	8	7	54
Grenville	5	4	6	5	4	3	27
Prescott	5	5	7	5	4	3	30
Russell	5	3	6	4	2	2	22
Stormont	11	9	15	10	9	7	62
Dundas	3	3	4	3	3	3	19
Glengarry	4	3	4	3	3	3	20
ST.LAWR	134	116	223	149	121	84	828
Occ/Per	38	49	26	20	13	2	
RPF=	1.18						
TOTAL	1481	1215	2246	1542	1274	868	8625

A5.2 Occasions by Origin Zone

O. ZONE	TOT OCCS	% HB	OCCS HB	%HB BCH O	HB BCH	OCCS NHB	%NHB BCH O	NHB BCH
NW Ont	5289	66	3490	30	1047	1798	40	719
NE Ont	12423	66	8199	40	3280	4224	40	1690
Metro	42263	63	26626	8	2130	15637	35	5473
Golden H	48686	71	34567	10	3457	14119	30	4236
SW Ont	36770	75	27578	20	5516	9193	25	2298
Georgian	9659	84	8113	55	4462	1545	50	773
East Ont	13249	80	10599	40	4240	2650	50	1325
St. Lawr	21236	73	15502	18	2790	5734	30	1720
Totals	189575		134675		26922	54900		18233

A5.3 Time-Distance Matrix (in hours)

	O.ZONE								...D.ZONE..	
D.ZONE	NWOnt	NEOnt	Metro	Gold	SWOnt	GBay	EOnt	StL	Aj	C.Aj
NWOnt	1.0	8.0	15.0	16.0	18.0	14.0	16.0	16.0	205	200
NEOnt	8.0	1.0	8.0	9.0	11.0	7.0	7.0	8.0	585	572
Metro	15.0	8.0	0.8	1.5	3.5	3.0	4.0	5.0	82	82
Golden	16.0	9.0	1.5	0.8	2.5	3.0	5.0	6.0	571	581
SWOnt	18.0	11.0	3.5	2.5	1.0	4.0	6.0	7.0	1120	1052
Gr-Bru	18.0	11.0	3.5	2.8	2.0	2.0	7.0	8.0	512	534
Simcoe	13.0	6.0	2.0	2.5	4.0	0.8	3.5	4.5	960	955
Shield	12.0	4.5	3.5	4.0	5.0	1.0	4.0	5.0	298	329
EOnt	16.0	7.0	4.0	5.0	6.0	4.0	1.0	2.0	438	395
St.Law	16.0	8.0	5.0	6.0	7.0	5.5	2.0	1.0	267	227

A5.4 Origin-Destination Matrixes (Uncalibrated)

NONHOMEBASED OCCASIONS (uncalibrated)

COEFF. -0.1

D.ZONE	NWOnt	NEOnt	Metro	Gold	SWOnt	GBay	EOnt	StL	Total	%	%ZinOnt
NWOnt	77	49	48	35	18	8	15	13	262	1.4%	2.0%
NEOnt	110	280	277	199	102	47	104	83	1202	6.6%	9.4%
Metro	8	20	80	59	30	10	20	16	242	1.3%	1.9%
Golden	48	123	518	441	234	68	125	98	1655	9.1%	12.9%
SWOnt	77	197	832	729	533	121	221	175	2886	15.8%	22.5%
Gr-Bru	35	90	381	324	221	68	92	72	1283	7.0%	10.0%
Simcoe	109	279	829	625	339	143	243	192	2760	15.1%	21.5%
Shield	37	101	221	167	95	43	72	57	794	4.4%	6.2%
EOnt	37	115	310	222	127	47	143	113	1113	6.1%	8.7%
St.Law	22	63	171	122	70	25	79	76	628	3.4%	4.9%
Ex Ont%	22%	22%	33%	31%	23%	25%	16%	48%			
Ex Ont	158	372	1806	1313	529	193	212	826	5408	29.7%	
EAjFD1j	1345	2487	3476	3495	3360	3597	3092	2846			
Total	719	1690	5473	4236	2298	773	1325	1721	18236	100.0%	100.0%

HOMEBASED AND TOTAL OCCASIONS (uncalibrated)

COEFF. -1.4

D.ZONE	NWOnt	NEOnt	Metro	Gold	SWOnt	GBay	EOnt	StL	Total	%	%ZinOnt	HB+NHB Total	HB+NHB %ZinOnt
NWOnt	1036	0	0	0	0	0	0	0	1037	3.9%	3.9%	1299	3.3%
NEOnt	0	3229	0	0	0	0	1	2	3231	12.0%	12.2%	4433	11.3%
Metro	0	0	330	126	10	13	9	4	490	1.8%	1.8%	731	1.9%
Golden	0	0	861	2330	283	88	16	2	3582	13.3%	13.5%	5237	13.3%
SWOnt	0	0	103	423	4536	43	8	0	5113	19.0%	19.3%	7999	20.3%
Gr-Bru	0	0	47	127	512	321	1	0	1008	3.7%	3.8%	2290	5.8%
Simcoe	0	5	719	363	58	3224	224	50	4641	17.2%	17.5%	7401	18.8%
Shield	0	12	27	14	4	756	34	8	856	3.2%	3.2%	1650	4.2%
EOnt	0	1	20	5	2	17	3376	753	4172	15.5%	15.7%	5285	13.4%
St.Law	0	0	3	1	0	0	507	1860	2373	8.8%	9.0%	3001	7.6%
Ex Ont%	1%	1%	1%	2%	2%	0%	1.5%	4%					
Ex Ont	10	33	21	69	110	0	64	112	419	1.6%		5828	
EAjFD1j	50	145	171	271	329	434	134	95	2790				
Total	1047	3280	2130	3457	5516	4462	4240	2790	26922	100.0%	100.0%	45155	100.0%

A5.4 Origin-Destination Matrices (Calibrated)

NONHOMEBASED OCCASIONS (calibrated)

D.ZONE	O.ZONE NWOnt	NEOnt	Metro	Gold	SWOnt	GBay	EOnt	StL	C.Tot.	C.%	CZinOn
										......D.ZONE......	
NWOnt	77	49	48	34	18	8	15	13	262	1.4%	2.0%
NEOnt	109	279	276	198	102	46	105	83	1200	6.6%	9.4%
Metro	8	20	81	60	31	10	20	16	247	1.4%	1.9%
Golden	50	128	538	457	243	70	130	103	1720	9.4%	13.4%
SWOnt	74	189	797	698	512	115	213	169	2766	15.2%	21.6%
Gr-Bru	37	96	404	343	235	71	98	78	1363	7.5%	10.6%
Simcoe	111	283	841	634	344	144	249	197	2803	15.4%	21.8%
Shield	42	113	249	188	107	49	81	65	894	4.9%	7.0%
EOnt	34	106	285	204	117	43	132	·105	1025	5.6%	8.0%
St.Law	19	55	148	106	61	21	69	66	546	3.0%	4.3%
Ex Ont%	22%	22%	33%	31%	23%	25%	16%	48%			
Ex Ont	158	372	1806	1313	529	193	212	826	5408	29.7%	
EAjFDij	1321	2441	3412	3431	3292	3542	3011	2766			
Total	719	1690	5473	4236	2298	773	1325	1721	18236	100.0%	100.0%

HOMEBASED AND TOTAL OCCASIONS (calibrated)

D.ZONE	O.ZONE NWOnt	NEOnt	Metro	Gold	SWOnt	GBay	EOnt	StL	C.Tot.	C.%	CZinOn	C.Tot.	CZinOn
										......D.ZONE......		..HB+NHB...	
NWOnt	1036	0	0	0	0	0	0	0	1037	3.9%	3.9%	1298	3.3%
NEOnt	0	3227	0	0	0	0	1	0	3229	12.0%	12.2%	4429	11.3%
Metro	0	0	328	125	11	12	11	2	489	1.8%	1.8%	736	1.9%
Golden	0	0	873	2358	302	88	18	4	3644	13.5%	13.7%	5364	13.6%
SWOnt	0	0	96	395	4466	39	8	2	5006	18.6%	18.9%	7772	19.8%
Gr-Bru	0	0	49	132	559	329	1	0	1069	4.0%	4.0%	2432	6.2%
Simcoe	0	5	712	359	61	3156	246	57	4596	17.1%	17.3%	7399	18.8%
Shield	0	14	30	15	5	821	42	10	937	3.5%	3.5%	1831	4.7%
EOnt	0	1	18	4	2	15	3371	781	4191	15.6%	15.8%	5216	13.3%
St.Law	0	0	3	1	0	1	478	1822	2304	8.6%	8.7%	2851	7.2%
Ex Ont%	1%	1%	1%	2%	2%	0%	2%	4%					1.6%
Ex Ont	10	33	21	69	110	0	64	112	419		1.6%		
EAjFDij	49	142	172	273	314	441	121	82				5828	
Total	1047	3280	2130	3457	5516	4463	4240	2790	26922	100.0%	100.0%	45155	100.0%

A5.5 Beach Use by Destination Zone and Site

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.USE
NORTHWESTERN ONTARIO												
unallocated										205	1299		200	1298
NORTHEASTERN ONTARIO												
unallocated										585	4433		572	4429
METRO TORONTO												
Ashbridge's Bay Pk	M	3	4	348	P	1		39%	13	117	1.0	13	117
Marie Curtis Pk	M	3	4	518	P	1		79%	7	59	1.0	7	60
Sir Casimir Gzowski Pk	M	2	4	872	P	1		81%	10	89	1.0	10	89
Toronto Islands	M	4	4	1849	P	4		40%	24	213	1.0	24	214
Woodbine B	M	3	6	532	P	1		39%	20	178	1.0	20	179
subtotal										74	655		74	659
unallocated =									9	76		9	77
10.4%												
total										82	731		82	736
GOLDEN HORSESHOE												
Albert E Crookes Memor	M	3	2	105	P	1			3	26	1.0	3	26
Albion Hills CA	CA	6	5	180	E	3			10	88	1.0	10	89
Bay Beach Corporation	Pr	4	5	152	G	4			0	0	1.0	0	0
Binbrook Dam & CA	CA	2	2	107	E	4			2	16	1.0	2	16
Bruce's Mill CA	CA	5	2	174	E	4		26%	2	19	1.0	2	19
Buffalo Canoe Club	Pr	6	4	137	G	4			0	0	1.0	0	0
Cedar B Pk	C	3	3	152	E	4		7%	1	8	1.0	1	8
Chippawa Cr CA	CA	2	3	135	E	4			4	40	1.0	4	40
Christie CA	CA	3	5	366	E	3			20	179	1.0	20	180
Claireville CA	CA	3	5	150	E	1		33%	11	98	1.0	11	98
Club La Salle	Pr	5	3	380	G	1			0	0	1.0	0	0
Confederation Pk APk	M	3	6	964	P	1		30%	41	379	1.0	41	381
Copetown Holiday Pk Lt	C	4	4	147	E	3			2	14	1.0	2	14
Courtcliffe Pk	C	1	2	122	E	3		33%	0	3	1.0	0	3
Crystal B Pk	C	5	3	229	G	4			1	11	1.0	1	11
Darlington PPk	PPk	2	2	152	P	2			3	28	4.0	12	112
Duffin Cr Waterfront A	CA	4	2	400	P	2			8	73	1.0	8	73
Fralicks B Lot	M	4	2	100	E	4			2	15	1.0	2	15
Glendale B	C	2	4	305	E	4			2	21	1.0	2	21
Gulliver's L & Pk	C	1	4	478	E	4			1	10	1.0	1	11
Hamilton B	M	4	2	4185	P	1			111	1019	1.0	111	1025
Humberstone Centennial	M	5	5	300	G	3		7%	13	115	1.0	13	116
Innes L Pk	C	2	6	240	E	4			2	16	1.0	2	17
Iroquois B	M	3	3	390	P	2			15	141	1.0	15	142
Jack Darling Memorial	M	4	3	165	P	1		11%	8	71	1.0	8	71
Jones B	C	4	5	228	G	1		7%	4	35	1.0	4	35
Kelso CA	CA	4	5	270	E	4			10	92	1.0	10	93
Knight's Dunmark Pk	C	4	3	117	E	3			1	10	1.0	1	10
Lakeside Pk	M	4	5	162	P	1			10	91	1.0	10	92
Lakeside Pk APk	M	5	5	366	G	1		100%	0	0	1.0	0	0
Lakeview Pk	M	4	4	395	P	1			24	223	1.0	24	224

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.USE
Liverpool Road Beachfr	M	3	5	427	P	2			20	181	1.0	20	182
Long Beach CA	CA	6	5	442	G	4			14	128	1.0	14	129
Milne CA	CA	5	5	183	E	1			20	179	1.0	20	180
Milne's Dam APk	M	3	4	102	E	1		67%	4	33	1.0	4	33
Municipal B	M	5	6	366	G	1		100%	0	0	1.0	0	0
Nelles Road APt	M	3	3	242	F	2			11	105	1.0	11	106
Nickel B	M	5	6	640	G	2		7%	40	368	1.0	40	370
Peninsula Mtl & Sunnyb	C	5	5	191	G	3			2	16	1.0	2	16
Petticoat Cr CA	CA	4	2	481	P	2			10	88	1.0	10	88
Place Polonaise	Pr	3	3	405	F	2			0	0	1.0	0	0
Preston L Pk	C	2	3	267	E	3			2	22	1.0	2	22
Queen's Royal Pk APk	M	5	4	122	G	2			8	76	1.0	8	76
Shadow L Camp	Pr	4	3	130	E	4			0	0	1.0	0	0
Sherkston Beaches Ltd	C	4	6	1682	G	3			15	139	1.0	15	140
Sunset B Pk	M	4	2	242	E	3		4%	5	49	1.0	5	49
Swiss Chalet Pk	C	4	4	209	E	3			2	17	1.0	2	18
Thorah Centennial Pk	M	6	2	248	G	3			5	44	1.0	5	45
Valens CA	CA	3	5	198	E	3			11	97	1.0	11	97
Westshore Glen Pk	M	3	2	103	P	2			2	19	1.0	2	19
Willow B CA	CA	5	4	366	G	4			12	106	1.0	12	107
subtotal									492	4509		501	4618
unallocated =									79	728		81	746
13.9%													
total									571	5237		581	5364

SOUTHWESTERN ONTARIO

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.USE
4 APt	P	3	3	460	G	2			27	190	1.0	27	19
6 APt	P	5	3	450	G	4			12	87	1.0	12	90
7 APt	P	5	3	430	G	4			12	83	1.0	12	86
9 APt	P	5	4	454	G	3			20	146	1.0	20	15
Amberley B APt	M	2	5	183	F	3			7	48	1.0	7	50
Ashfield Twp Pk	M	2	5	480	F	3			18	127	1.0	18	131
Barber's B	C	2	3	112	E	4			1	5	1.0	1	5
Baron de Tuyle Prop. A	P	2	2	480	G	3			9	67	1.0	9	69
Bathurst Amusements Lt	C	3	6	400	G	3			4	26	1.0	4	27
Bayfield B	M	4	2	642	G	3			12	89	1.0	12	92
Beatty Access	P	4	4	285	G	3			13	92	1.0	13	9
Bingeman Pk	C	2	3	366	E	1			7	48	1.0	7	4
Blue Anchor Trailer Pk	C	1	4	274	G	3			1	6	1.0	1	6
Blue Springs Recreatio	C	4	3	250	E	1			5	33	1.0	5	3
Camp Canbay	Pr	2	2	400	G	3			0	0	1.0	0	
Camp Menesetung	Pr	2	3	183	F	3			0	0	1.0	0	0
Canatara Pk APk	M	3	4	402	G	2			27	194	1.0	27	201
Cedar B	P	5	4	144	E	3			8	55	1.0	8	5
Cedar Bay Trailer Pk	C	6	4	410	G	4			3	18	1.0	3	1
Circle R Ranch	C	2	2	274	E	3			1	9	1.0	1	9
Colchester B Pk & Harb	M	5	4	160	E	4		30%	4	30	1.0	4	3
Conestogo Bible Camp	Pr	2	3	100	G	4			0	0	1.0	0	
Country Gardens Cg	C	4	5	305	E	4			2	16	1.0	2	17
C.M. Wilson CA	CA	5	2	200	E	3			5	33	1.0	5	34
Dover B Pk	PPk	6	3	156	E	4			5	36	1.0	5	3
Dunlop Road APt	M	2	2	480	F	3			8	55	1.0	8	5

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.USE
East B Pk	M	5	3	244	E	6			2	16	1.0	2	16
Erie Woods Trailer Pk	C	2	2	275	G	3			1	8	1.0	1	8
Erieau B	M	4	4	435	G	4			14	98	1.0	14	101
Family Paradise Pk	C	4	2	150	E	6			0	1	1.0	0	1
Fanshawe L CA	CA	2	3	122	E	2		7%	8	55	1.0	8	57
Goderich B	M	3	6	151	F	2			8	60	1.0	8	62
Guelph Recreational Pk	M	4	4	229	E	3			12	87	1.0	12	90
Hay Sideroad 20 APt	M	2	3	480	G	3			19	132	1.0	19	137
Hay-Stephen Twp Line A	P	2	3	420	G	3			16	116	1.0	16	120
Hillside L Pk	C	2	2	158	E	3			1	5	1.0	1	5
Holiday B PPk	PPk	4	4	430	E	4			16	115	0.4	6	47
Holiday Harbour Rec Re	C	5	4	215	E	4			2	11	1.0	2	12
Huron Church Camp	Pr	3	2	406	G	3			0	0	1.0	0	0
Huron View Pk APk	M	2	2	304	G	3			6	42	1.0	6	44
Ipperwash B APt "A"	P	5	4	519	G	4			16	117	1.0	16	121
Ipperwash B APt "B"	P	5	4	494	G	4			16	111	1.0	16	115
Ipperwash B APt "C"	P	5	4	491	G	4			16	111	1.0	16	115
Ipperwash B APt "E"	P	5	4	542	G	4			17	122	1.0	17	126
Ipperwash B APt "G"	P	5	4	400	G	4			13	90	1.0	13	93
Ipperwash PPk	PPk	5	4	369	G	4			12	83	1.5	17	129
Iroquois B PPk	PPk	5	4	500	G	3			23	161	0.7	16	117
Kent County Pk	M	5	2	324	G	4			4	32	1.0	4	33
Kitchigami Camp	C	4	3	188	.F	3			1	8	1.0	1	9
Knight's B	C	4	3	481	G	4			3	19	1.0	3	19
L Whittaker CA	CA	1	2	274	E	4			3	23	1.0	3	24
Lakeside Summer Resort	C	5	3	303	E	4			2	14	1.0	2	14
Lambton United Church	Pr	5	3	130	G	4			0	0	1.0	0	0
Linden B B	Pr	6	3	245	E	3			0	0	1.0	0	0
Mersea Centennial	M	5	3	131	E	4			4	30	1.0	4	31
Mint Valley B Pk	C	5	3	183	G	3			1	10	1.0	1	10
New Hockley Hills Hote	C	3	4	150	F	4			1	6	1.0	1	6
Norfolk CA	CA	4	2	409	G	3			8	57	1.0	8	59
Norwich CA	CA	2	4	150	E	3			8	57	1.0	8	59
Orchard View Pk Enterp	C	5	2	183	G	4			0	4	1.0	0	4
Parkside Trailer Pk	C	6	4	200	G	4			1	9	1.0	1	9
Paul Bunyan Cg	C	3	2	263	G	3			1	7	1.0	1	8
Pinehurst CA	CA	4	2	100	E	3			2	16	1.0	2	17
Pinery PPk	PPk	5	3	2040	G	3			79	563	1.0	79	582
Point Pelee NPk	NPk	4	3	3210	E	4			103	733	1.0	103	758
Polska Plaza H A	Pr	5	4	110	E	4			0	0	1.0	0	0
Port Blake CA	CA	2	2	182	G	3			4	25	1.0	4	26
Port Bruce PPk	PPk	4	5	440	G	3			20	142	1.0	20	147
Port Dover Main B	M	4	2	503	G	2			15	105	1.0	15	109
Port Stanley CA	CA	2	4	240	G	3			11	77	1.0	11	80
Rondeau PPk	PPk	2	4	1602	G	4			51	361	0.5	25	187
Sand Hill Pk	C	4	6	454	G	4			3	20	1.0	3	21
Sand Point Pk	M	3	4	100	E	1			11	76	1.0	11	79
Sarnia Centennial Pk	PPk	3	2	145	G	2		4%	4	29	1.0	4	30
Sarnia Riding Club	Pr	3	3	108	G	2			0	0	1.0	0	0
Schneider's Pk B	C	2	4	330	E	4			2	18	1.0	2	18
Seacliffe Pk	M	6	5	185	E	2			15	106	1.0	15	109
Shade's Mills CA	CA	3	5	213	E	1			23	162	1.0	23	168

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.US
Sheppardton Road APt	M	2	3	400	F	3			13	90	1.0	13	93
Springwater CA & Tract	CA	2	4	150	E	4			6	40	1.0	6	41
Stanley Sideroad 15 AP	P	2	3	480	G	3			19	132	1.0	19	13
St. Josephs B APt	M	2	4	480	G	3			22	155	1.0	22	160
Sun Valley B Pk	C	6	4	436	G	4			3	20	1.0	3	20
Sunnibank Pk	C	2	2	183	E	4			1	4	1.0	1	
Thedford CA	CA	2	2	305	E	3			7	50	1.0	7	5
Trout L Pk	C	3	2	560	E	4			2	13	1.0	2	13
Turkey Point PPk	PPk	4	3	803	G	4			22	155	0.7	15	112
Union Sideroad B APt	P	2	4	480	F	3			18	127	1.0	18	13
Warwick CA	CA	2	4	128	E	3			7	49	1.0	7	5
Waterford CA	CA	3	4	823	E	3			44	313	1.0	44	324
Wees B Access	Pr	4	4	480	G	2			0	0	1.0	0	
Wheatley PPk	PPk	2	3	740	E	3			34	241	0.4	14	10
Wildwood CA	CA	2	5	150	E	3			8	57	1.0	8	59
Wildwood Pk	M	4	4	182	G	3		4%	8	56	1.0	8	5
Willow B	P	6	3	400	E	3			18	130	1.0	18	13
Willow B Pk Walpole Is	C	2	3	123	E	4			1	6	1.0	1	0
Woodrow B Access	Pr	4	3	400	G	2			0	0	1.0	0	0
subtotal									1033	7384		971	717
unallocated =									86	616		81	59
7.7%													
total									1120	7999		1052	77

GREY-BRUCE

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.US
Ainslie Wood CA	CA	3	4	250	P	4			6	29	1.0	6	29
Berford L APk	M	3	4	102	P	5			1	6	1.0	1	
Black Creek PPk Reserv	P	3	4	305	P	4			7	29	1.0	7	
Blue Mountain Camp	Pr	2	4	100	F	3			0	0	1.0	0	0
Blue Water B APk	M	4	4	300	P	2			14	62	1.0	14	
Bruce B	P	2	2	480	F	4			5	24	1.0	5	
Bruce Twp Shoreline	M	3	3	2221	F	5			28	125	1.0	28	128
Brucedale CA	CA	6	2	180	F	5			1	5	1.0	1	
Bud & Barbs T & T Pk	C	3	4	220	F	3			2	7	1.0	2	
Con XI Public B	P	3	2	320	F	4			4	16	1.0	4	1
Con XII Public B	P	3	2	576	F	3			9	41	1.0	9	4
Craigleith B Area	M	3	3	100	F	3			3	14	1.0	3	
Dorcas Bay Pk APk	P	6	3	152	P	3			4	18	1.0	4	
Eidt's Grove B	M	4	3	241	F	4			5	24	1.0	5	2
Evergreen Resort	C	5	2	242	P	4			0	2	1.0	0	
Gobles Grove B	M	4	3	201	F	3			6	28	1.0	6	
Hidden L Cottages	C	3	2	300	F	3			1	4	1.0	1	
Huron Ridge	M	2	2	1110	F	2			27	119	1.0	27	12
Inverhuron PPk	PPk	1	2	182	F	4			2	7	4.0	6	
Kelso B APk	M	3	5	270	F	2			15	67	1.0	15	
Kenwood Cottages	C	3	3	100	F	3			1	3	1.0	1	
Lansdowne Pk	M	2	3	240	F	2			11	51	1.0	11	
Lion's Head B APk	M	3	3	152	P	4			3	13	1.0	3	
Lurgan B	P	4	2	592	F	4			7	30	1.0	7	3
MacGregor Point PPk	PPk	4	3	416	F	5			5	24	4.0	21	9
Memorial Pk APk	M	3	4	130	F	2			7	32	1.0	7	
Miramichi B	M	5	2	426	F	5			3	12	1.0	3	

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.USE
Natural B APk	M	5	4	2280	F	2			126	564	1.0	126	575
N. Sauble B APk	M	5	4	1089	P	4			23	105	1.0	23	107
Pine R Public B	P	4	3	400	F	4			9	40	1.0	9	40
Pioneer Pk	C	3	3	350	G	3			3	12	1.0	3	12
Point Clark B	P	5	3	400	F	4			9	40	1.0	9	40
Port Elgin B	M	6	4	373	F	2		4%	20	89	1.0	20	91
Queen's Bush B	M	5	3	106	F	3			3	15	1.0	3	15
Red Bay Municipal Pk	M	5	3	135	P	4			2	11	1.0	2	11
Regatta Bay Access	M	5	4	165	P	4			4	16	1.0	4	16
R. Macdonald's T & T P	C	1	4	122	P	3			0	1	1.0	0	1
Sauble B Indian Pk	C	5	4	1722	P	4			7	33	1.0	7	34
Saugeen B	M	4	2	964	F	3			15	69	1.0	15	70
Saugeen Cedars	C	3	2	520	G	3			2	9	1.0	2	9
South B	M	6	3	530	F	2			25	112	1.0	25	114
South Bruce B	P	5	2	688	F	4			8	34	1.0	8	35
Southampton B APk	M	3	2	792	F	2			19	85	1.0	19	86
Station B	M	2	3	554	F	2			26	117	1.0	26	120
Stephen's Cottages	C	3	2	100	F	3			0	1	1.0	0	1
Sunnyside B Cottages	C	2	2	175	P	5			0	1	1.0	0	1
Tyrolean Village Resor	C	4	6	330	F	3			2	11	1.0	2	11
Varney CA	CA	3	4	140	F	3			5	23	1.0	5	24
W D Ranch	C	3	4	100	F	3			1	3	1.0	1	3
Wildwood Lodge Ltd.	C	6	5	183	P	4			1	4	1.0	1	4
subtotal									489	2185		509	2320
unallocated =									24	105		25	112
4.6%													
total									512	2290		534	2432
SIMCOE													
8th St Ossossane B APt	M	3	3	160	F	4			4	27	1.0	4	27
Atherley Pk	M	5	2	180	G	3			4	27	1.0	4	27
Balm B Access	U	3	4	400	F	4			10	80	1.0	10	80
Balm B APt	M	4	4	125	F	4			3	25	1.0	3	25
Balm B APt	M	4	4	400	F	4			10	80	1.0	10	80
Balsam Drive APt	M	3	2	130	F	4			1	11	1.0	1	11
Barr Point Christian I	C	4	3	440	F	6			1	4	1.0	1	4
Bayfield Pk	M	4	5	195	F	4			5	39	1.0	5	39
Bayfort Camp	C	5	3	143	F	3			1	7	1.0	1	7
Bayview-Wildwood Resor	C	4	2	120	G	4			0	3	1.0	0	3
Beau Rivage Ave. APt	M	4	3	175	F	4			4	30	1.0	4	30
Belle Vue Ave. APt	M	4	3	275	F	4			6	47	1.0	6	47
Betty Avenue Access	M	3	3	400	F	4			9	68	1.0	9	68
Bien Venue Ave APt	M	3	3	250	F	4			6	43	1.0	6	43
Big Chief Camp	Pr	4	2	119	G	3			0	0	1.0	0	0
Birch Avenue APt	M	3	2	130	F	4			1	11	1.0	1	11
Brewery Bay B & Tennis	Pr	4	2	119	G	2			0	0	1.0	0	0
Brook Avenue APt	M	4	3	250	F	4			6	43	1.0	6	43
Cawaja B Access	U	3	3	100	F	4			2	17	1.0	2	17
Cawaja B APt	P	3	3	400	F	4			9	68	1.0	9	68
Cedar Drive APt	M	3	2	100	F	4			1	9	1.0	1	9
Cedar Grove Road APt	M	4	3	415	F	4			9	71	1.0	9	71
Cedar Lane Access	U	3	3	420	F	4			9	72	1.0	9	72

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.USE
Cedar-Grove Cgs	C	5	2	240	F	2			1	9	1.0	1	9
Centennial Pk	M	3	5	230	G	2		4%	15	116	1.0	15	116
Chez Nous Ave. Access	P	4	3	290	F	4			6	49	1.0	6	50
Con IV Tiny APt	M	3	4	440	F	4			11	88	1.0	11	88
Con IX Tiny APt	M	4	3	390	F	4			9	66	1.0	9	67
Con V Tiny APt	P	4	2	450	F	4			5	39	1.0	5	39
Con VIII Tiny APt	M	3	3	410	F	4			9	70	1.0	9	70
Con XI APt	M	3	3	480	F	4			11	82	1.0	11	82
Con XIII Pk and Access	M	4	4	480	F	4			12	96	1.0	12	96
Con XIV APt	M	3	3	430	F	4			10	73	1.0	10	73
Con XV APt	P	4	3	190	F	4			4	32	1.0	4	31
Con XVI Reach Pk	M	3	3	406	F	4			9	69	1.0	9	70
Con XX APt	M	3	3	153	F	5			2	15	1.0	2	15
County Road 25 APt	M	4	4	180	F	4			5	36	1.0	5	36
County Road 29 APt	M	3	4	440	F	4			11	88	1.0	11	88
County Road 6 APt	M	4	4	410	F	4			11	82	1.0	11	82
Culver Trail APt	M	3	3	200	F	4			4	34	1.0	4	34
Deanlea B Assoc Inc Ac	Pr	4	5	320	F	4			0	0	1.0	0	0
Deanlea B Assoc Inc Ac	Pr	3	4	300	F	4			0	0	1.0	0	0
Dutcher Drive APt	M	3	3	400	F	4			9	68	1.0	9	68
Earl Rowe PPk	PPk	4	6	534	G	3			24	186	0.7	17	134
Enchantement Ave. APt	M	4	3	420	F	4			9	72	1.0	9	72
Farlain L APt	M	3	2	875	F	4			10	75	1.0	10	76
Georgina B APt	P	4	2	454	F	4			5	39	1.0	5	39
Grandolph Bay Access	U	3	4	100	F	4			3	20	1.0	3	20
Hide-a-Way Inn	C	4	2	117	F	2			1	4	1.0	1	4
High Street APt	M	4	4	200	F	4			5	40	1.0	5	40
Innisfil Centennial Pk	M	4	2	315	G	4			4	33	1.0	4	33
Innisfil Pk	M	4	5	470	G	4			15	114	1.0	15	115
Ispiming B Access	M	4	3	125	F	5			2	12	1.0	2	12
Johnson B	M	4	4	125	G	2		8%	8	60	1.0	8	60
Juniper Trail Access	U	3	3	415	F	4			9	71	1.0	9	71
Karen Road APt	M	3	4	460	F	4			12	92	1.0	12	92
Lagoon City Community	Pr	6	3	195	G	4			0	0	1.0	0	0
Lakeview Lane APt	M	4	3	150	F	4			3	26	1.0	3	26
Laurel Avenue APt	M	3	3	460	F	4			10	78	1.0	10	79
Lawrence Pk	C	4	4	105	G	2			1	11	1.0	1	11
Lesperance Dr. APt	P	4	4	200	F	4			5	40	1.0	5	40
Locust Trail Access	U	3	3	350	F	4			8	60	1.0	8	60
Mackenzie Pk	M	3	4	123	F	3			5	35	1.0	5	35
Mara PPk	PPk	4	4	180	G	3			8	63	1.0	8	63
Marygrove Camp	Pr	4	2	105	F	4			0	0	1.0	0	0
Maurice Road APt	M	4	3	250	F	5			3	24	1.0	3	24
McRae Point PPk	PPk	4	3	394	G	5			6	47	1.5	9	71
Midland Little L Pk	M	4	4	1080	F	2		4%	58	444	1.0	58	444
Minet Point Pk	M	4	4	138	G	2			9	72	1.0	9	72
Monague B Chris. Is. A	C	4	4	480	F	6			1	5	1.0	1	5
Monica Road APt	M	3	3	450	F	4			10	77	1.0	10	
Mountain View B APt	M	3	3	480	F	4			11	82	1.0	11	82
Nottawaga B APt	P	4	4	480	F	4			12	96	1.0	12	96
N. of Betty Ave. APt	M	3	2	420	F	4			5	36	1.0	5	
N. of Con XVI APt	M	4	3	440	F	4			10	75	1.0	10	

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.USE
N. of Red Pine Trail A	M	3	3	150	F	4			3	26	1.0	3	26
Ont Govt Staff Develop	Pr	3	2	240	G	4			0	0	1.0	0	0
Oro Memorial Pk	M	2	4	262	G	4			8	64	1.0	8	64
Ossossane B APt	M	3	2	220	F	4			2	19	1.0	2	19
Ossossane B APt	M	4	3	300	F	4			7	51	1.0	7	51
Ossossane B APt	P	4	2	170	F	4			2	15	1.0	2	15
Ossossane B APt	M	3	2	575	F	4			6	49	1.0	6	50
Paradise Point Pk	M	2	4	201	F	4			5	40	1.0	5	40
Park Road APt	M	3	3	415	F	4			9	71	1.0	9	71
Pebble Beach Christian	C	4	2	300	F	6			0	1	1.0	0	1
Penetanguishene APk	M	4	4	180	F	2			10	77	1.0	10	77
Pine Forest Beach Est	Pr	3	3	175	F	4			0	0	1.0	0	0
Prince Albert Parkwy A	Pr	3	4	350	F	4			0	0	1.0	0	0
Rainbow Valley Cgs	C	2	2	276	G	3			1	8	1.0	1	8
Red Pine Trail APt	M	3	3	100	F	4			2	17	1.0	2	17
Sandy Bay B APt	C	4	3	480	F	6			1	5	1.0	1	5
Scanlon Cr CA	CA	3	3	183	E	3			8	64	1.0	8	65
Silver Birch Trail APt	M	3	3	420	F	4			9	72	1.0	9	72
Souvenir Avenue APt	M	4	3	175	F	4			4	30	1.0	4	30
Suncity Trailer Pk	C	4	2	102	F	3			0	3	1.0	0	3
S. of Betty Ave Access	U	3	3	430	F	4			10	73	1.0	10	74
S. of Locust Trail APt	M	3	3	420	F	4			9	72˙	1.0	9	72
Tottenham CA	CA	4	4	105	E	2			8	65	1.0	8	65
Tranquilité Ave APt	M	4	·3	150	F	4			3	26	1.0	3	26
Tudhope Memorial APk	M	2	2	350	G	2			10	79	1.0	10	79
Wasaga B PPk	PPk	5	2	14241	F	3			227	1749	1.0	227	1757
Washago Centennial	M	4	2	117	G	3			2	18	1.0	2	18
Wendake Road APt	M	4	2	470	F	4			5	40	1.0	5	41
West of Bay Road APt	M	3	2	120	F	5			1	6	1.0	1	6
Woodland B APk	M	6	3	1270	F	4			28	217	1.0	28	217
Wymbolwood B	M	3	3	400	F	4			9	68	1.0	9	68
subtotal									908	7001		904	6999
unallocated =									52	400		52	400
5.4%													
total						.			960	7401		955	7399

SHIELD

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.USE
Algonquin PPk/Canisbay PPk		4	2	101	P	3			1	7	1.0	1	7
Algonquin PPk/Kearney PPk		3	2	116	P	3			2	9	1.0	2	9
Algonquin PPk/L of Two PPk		3	2	121	P	3			2	9	1.0	2	9
Algonquin PPk/L of Two PPk		3	2	196	P	3			3	14	1.0	3	14
Algonquin PPk/Mew L Cg PPk		4	4	171	P	3			5	29	1.0	5	29
Algonquin PPk/Pog L Cg PPk		2	2	112	P	3			1	8	1.0	1	8
Algonquin PPk/Rock L C PPk		3	2	194	P	5			1	6	1.0	1	6
Algonquin PPk/Tea L Cg PPk		2	2	102	P	3			1	7	1.0	1	8
Anglers Inn	C	4	3	100	F	5			0	1	1.0	0	1
Arrowhead PPk	PPk	3	3	505	F	3			16	88	1.5	24	133
Bayview Pk	C	5	3	215	F	4			1	5	1.0	1	5
Bemaba Lodge	C	2	2	123	P	4			0	1	1.0	0	1
Big East R Motel	C	2	3	100	F	3			1	3	1.0	1	4
Birch Point Lodge	C	4	3	284	F	4			1	7	1.0	1	7
Bogart's Cottages	C	6	2	100	F	5			0	1	1.0	0	1

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.US
Bonnie Lake Cottages &	C	5	3	183	F	5			0	3	1.0	0	3
Braeside Lodge and Mot	C	4	4	211	F	3			2	9	1.0	2	9
Brickell's Cottages	C	2	5	168	F	3			1	7	1.0	1	
Buckslide Tent & Trail	C	5	4	244	F	3			2	10	1.0	2	10
Callander B	M	3	2	200	F	3			3	18	1.0	3	18
Camp Kiwanis Vesle Ska	Pr	4	2	145	P	4			0	0	1.0	0	
Clover Leaf Cottages	C	3	4	152	P	3			1	5	1.0	1	
Crystal B Cottages	C	0	4	136	F	3			0	0	1.0	0	0
Deer Lodge	C	4	3	144	F	3			1	5	1.0	1	5
Dunbar's Cottages	C	3	2	147	P	3			0	2	1.0	0	
Dwight Public B	M	4	2	212	F	3			3	19	1.0	3	19
Echo Hills Pk	C	4	3	102	F	3			1	4	1.0	1	4
Edgewater B	C	4	3	274	F	4			1	7	1.0	1	
Fairfield Bay Cottages	C	3	4	124	F	3			1	5	1.0	1	
Grundy L PPk	PPk	3	2	1055	F	3			17	93	1.0	17	94
Haliburton Lodge	C	4	3	552	F	6			1	4	1.0	1	4
Halimar Resort Ltd.	C	3	5	300	F	4			2	9	1.0	2	
Hockey Opportunity Cam	Pr	4	2	125	P	5			0	0	1.0	0	0
Hollow Valley Lodge an	C	2	4	141	F	3			1	6	1.0	1	6
Kervin's Holiday Homes	C	4	2	300	F	5			0	2	1.0	0	
Killbear PPk	PPk	4	4	1938	F	3			72	396	1.0	72	396
Kinsmen B Pk	M	5	3	160	F	3			5	28	1.0	5	28
Kushog Korner Cottages	C	3	2	152	F	3			0	3	1.0	0	3
Lagoon Trailer Pk	C	2	2	188	F	3			1	3	1.0	1	
Lakeview Lodge	C	4	4	210	F	5			1	3	1.0	1	3
Lawsons Cottages	C	6	2	210	F	3			1	4	1.0	1	4
Layolomi B Inn	C	6	4	331	P	5			1	5	1.0	1	
Lost Forest Pk	C	2	2	136	P	5			0	1	1.0	0	
Maple Sands Resort	C	5	5	183	F	3			1	7	1.0	1	8
Mikisew PPk	PPk	6	4	139	P	4			3	17	3.0	9	
Moonlight Bay Cottages	C	4	3	148	F	2			1	8	1.0	1	
Moorelands Kawagama Ca	Pr	3	3	135	P	5			0	0	1.0	0	0
Oastler L PPk	PPk	4	3	255	F	3			8	45	1.5	12	67
Oblong L Cottages	C	2	2	147	P	4			0	2	1.0	0	
Oxtongue L Cottages	C	5	4	146	P	3			1	5	1.0	1	
Parkwood B Cg Ltd.	C	4	3	426	F	3			3	15	1.0	3	15
Paudash L Access	P	3	4	146	F	3			5	30	1.0	5	
Pickerel L Lodge	C	4	3	114	P	6			0	1	1.0	0	
Pine Valley Camp	C	3	3	109	F	6			0	1	1.0	0	
Pinedale Inn Motel	C	6	2	150	F	2			1	4	1.0	1	
Pinelands Lodge	C	2	5	115	F	3			1	5	1.0	1	
Port Sydney B	M	4	3	125	F	3			4	22	1.0	4	
Red Deer Cottages	C	3	2	106	F	4			0	1	1.0	0	
Restoule PPk	PPk	4	4	450	F	3			17	92	0.5	8	
Ronville Lodge	C	4	3	148	F	3			1	5	1.0	1	
Rostrevor B Resort	C	4	2	173	F	5			0	1	1.0	0	
Sand Bay Resort	C	3	3	135	P	6			0	1	1.0	0	
Sand L Cabins	C	3	2	128	P	3			0	2	1.0	0	
Sandhurst 4 Seasons	C	4	3	350	P	3			2	10	1.0	2	10
Shangrila Camping Reso	C	2	2	153	P	3			0	2	1.0	0	
Silent L PPk	PPk	3	4	138	F	3			5	28	1.5	8	
Silver Sands T & T Pk	C	2	3	241	F	3			2	8	1.0	2	

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.USE
Sir Sam's Inn and Ski	C	2	3	300	P	4			1	6	1.0	1	6
Six Mile L PPk	PPk	4	2	132	F	3			2	12	6.0	13	70
South L Trailer Pk	C	5	5	153	F	3			1	6	1.0	1	6
Star L Lodge & Campsit	C	5	2	270	F	5			0	2	1.0	0	2
Strong Twp Pk	M	6	2	141	P	5			1	4	1.0	1	4
Sunlit Bay Tent & Trai	C	3	3	150	F	5			0	2	1.0	0	2
The Homestead Cottage	C	2	4	152	F	3			1	6	1.0	1	6
The Old Mill Cottage R	C	2	3	180	F	3			1	6	1.0	1	6
Waltonian Inn	C	4	3	280	F	5			1	4	1.0	1	4
White Birches Cottages	C	5	2	232	P	3			1	3	1.0	1	3
Wig-a-mog Inn	C	4	2	118	F	3			0	2	1.0	0	2
Winnetou Resort	C	5	2	125	P	5			0	1	1.0	0	1
subtotal									219	1211		241	1344
unallocated =									79	439		87	487
26.6%													
total									298	1650		329	1831

EASTERN ONTARIO

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.USE
Adolphustown Pk	PPk	3	3	200	F	3			6	76	1.0	6	83
Balsam L PPk	PPk	4	4	410	G	4			13	156	1.0	13	171
Barry's Bay Public B	M	4	3	165	P	3			4	52	1.0	4	57
Bay Haven	C	6	6	244	F	4			1	15	1.0	1	17
Beach Pk	M	2	5	198	P	2			9	110	1.0	9	121
Beavermead Pk	M	2	6	150	E	1		47%	8	102	1.0	8	111
Birdsall B Trailer Pk	C	6	4	100	E	5			0	5	1.0	0	6
Bon Echo PPk	PPk	3	3	350	G	3			14	163	1.0	14	178
Bona Vista Trailer Pk	C	2	3	118	F	3			1	9	1.0	1	10
Bonnechere PPk	PPk	6	3	306	F	3			10	117	0.3	3	38
Camp Fisherman	C	5	3	180	G	4			1	12	1.0	1	13
Camp Madawaska	Pr	3	2	225	P	6			0	0	1.0	0	0
Canoe L T. & T. Pk	C	2	2	115	G	5			0	2	1.0	0	2
Carson L Cottages	C	5	2	105	P	3			0	3	1.0	0	4
Cedar B Camp	C	6	3	249	F	5			1	8	1.0	1	8
Cedardale Camp	C	2	3	158	F	4			1	8	1.0	1	9
Cedars Cottages	C	5	4	406	G	3			4	44	1.0	4	48
Chippawa Lodge	C	4	3	303	P	5			1	8	1.0	1	8
Cobourg Yacht Club	Pr	3	4	158	P	2			0	0	1.0	0	0
Cold Cr Road B	M	5	2	400	F	5			3	31	1.0	3	34
Cove B Pk	C	6	2	400	F	4			1	11	1.0	1	12
Davis B	C	3	2	100	P	4			0	2	1.0	0	2
Desert L Cg	C	3	2	300	G	4			1	10	1.0	1	11
Dunne's Resort	C	6	2	354	F	3			1	14	1.0	1	15
Dupont of Canada Ltd.	Pr	3	4	560	F	2		4%	0	0	1.0	0	0
Edgewater Pk Trailer C	C	6	5	213	F	4			1	13	1.0	1	15
Emily PPk	PPk	3	4	283	G	4			9	108	1.0	9	118
Flinton Pk	C	4	2	120	E	3			1	7	1.0	1	7
Gardner's Lodge	C	6	3	117	G	5			0	4	1.0	0	5
Gillies Bros. B	C	2	2	144	G	4			0	5	1.0	0	5
Grass Cr Pk	M	3	3	110	F	3		16%	3	35	1.0	3	39
Hideaway Trailer Pk	C	5	2	418	F	4			1	11	1.0	1	12
Hogans Haven	C	2	2	100	G	4			0	3	1.0	0	4
Inverlea Pk	M	1	2	150	E	1		63%	2	23	1.0	2	25

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.USE
Jubalee B Pk	C	2	3	384	P	3			2	24	1.0	2	27
Kring's Lodge	C	4	2	300	G	5			0	6	1.0	0	6
Kumalongway-Inn-Resort	C	3	3	200	P	6			0	3	1.0	0	3
L Doré Tent & Trailer	C	5	2	161	F	5			0	2	1.0	0	3
L St. Peter PPk	PPk	3	4	120	P	3			4	45	0.3	1	15
La Mure B	M	6	4	133	F	2			7	89	1.0	7	97
Lake Breeze Cottages	C	3	4	503	G	5			2	22	1.0	2	24
Lakefield Pk	M	2	3	125	E	2			9	103	1.0	9	113
Lakeview Farms	C	3	2	100	E	3			0	6	1.0	0	6
Lang Mill CA	CA	4	4	195	E	4		41%	4	52	1.0	4	57
Laurentian View Cottag	C	4	3	142	F	6			0	2	1.0	0	
Lehman's Timber Sands	C	4	4	111	G	4			1	8	1.0	1	9
Lemkes Lodge	C	5	2	175	G	5			0	3	1.0	0	4
Lemoine Point CA	CA	1	5	444	F	2		4%	8	91	1.0	8	100
Leo's Boat Livery	C	4	2	102	E	4			0	4	1.0	0	
Levair Campsite	C	6	2	120	F	3			0	5	1.0	0	5
Long L Cg	C	3	3	107	P	4			0	5	1.0	0	
Lutherlyn Camp	Pr	5	2	448	F	4			0	0	1.0	0	
L'Escale Camping and M	C	1	6	404	F	3			1	12	1.0	1	13
Marble Point Resort	C	2	2	200	E	4			1	8	1.0	1	9
McMillan's Cottages	C	4	2	134	F	3			0	5	1.0	0	
Mohawk B	C	5	3	430	G	4			2	28	1.0	2	3
Nangor Resort	C	4	5	524	F	6			1	9	1.0	1	10
North B PPk	PPk	4	3	1128	F	4			25	301	0.2	5	6
North Star Resort	C	4	3	349	F	3			2	27	1.0	2	2
Old Forge Cottages	C	4	2	216	F	5			0	3	1.0	0	4
Palmerston Canonto CA	CA	4	3	100	G	5			2	19	1.0	2	20
Petawawa Centennial Pk	M	3	2	132	F	2			3	38	1.0	3	4
Petawawa Point	M	4	4	420	F	2			23	281	1.0	23	30
Picnic Chandos L	P	3	6	165	G	3			7	90	1.0	7	98
Picnic-B Area	P	5	2	110	P	3			1	18	1.0	1	1
Pine Point B	M	6	5	240	F	3			9	107	1.0	9	11
Pinecrest Resort	C	3	3	110	F	3			1	8	1.0	1	9
Pleasant Bay B	P	5	2	481	F	4			5	65	1.0	5	7
Presqu'ile PPk	PPk	4	6	900	F	4			23	281	0.7	16	21
Pt. Alexander Public A	M	5	3	400	F	3			13	153	1.0	13	16
Rideau Acres Cg	C	4	3	100	G	3			1	11	1.0	1	12
Rider's Tent & Trailer	C	3	3	160	G	5			0	6	1.0	0	
Riverwood Trailer Pk	C	4	5	180	E	3			2	23	1.0	2	
Roblin L Pk	M	5	2	130	G	4			2	21	1.0	2	23
Roger's Cove Pk	M	6	4	244	E	1		42%	15	183	1.0	15	20
Round L Resort	C	5	3	200	F	3			1	15	1.0	1	
Ryans Campsite	C	6	4	152	F	3			1	14	1.0	1	1
Sandbanks B Resort	C	6	4	305	F	4			2	19	1.0	2	21
Sandbanks PPk	PPk	5	5	1060	F	4			27	331	1.0	27	3
Sandy B Cottages	C	6	2	198	F	3			1	8	1.0	1	
Schooner L Public Acce	P	5	4	129	G	6			1	14	1.0	1	1
Serpent Mounds PPk	PPk	3	3	100	E	4			3	39	1.5	5	
Shelter Valley Pk	C	6	2	100	E	4			0	4	1.0	0	
Spurr B Pk	C	3	2	250	P	3			1	8	1.0	1	
Tweed Memorial Pk	M	3	2	180	E	3			4	50	1.0	4	5
T-Bell Resort	C	4	2	121	G	4			0	4	1.0	0	

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	_CC	C.ATT.	C.USE
Undeveloped Big Sandy	P	3	3	460	F	6			3	35	1.0	3	38
Victoria Centennial Pk	M	5	6	215	G	3			10	117	1.0	10	128
Victoria Pk APk	M	6	4	422	P	2			19	235	1.0	19	257
Wadsworth L Public B	M	5	2	168	P	4			2	19	1.0	2	21
Wahoo Cottages	C	3	4	270	G	3			2	29	1.0	2	32
Woodcrest Pk	C	6	3	165	G	5			1	6	1.0	1	7
York Farm Cottages	C	6	2	222	F	4			0	6	1.0	0	7
subtotal									355	4286		320	4230
unallocated =									83	999		75	986
18.9%													
total									438	5285		395	5216

ST. LAWRENCE

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	_CC	C.ATT.	C.USE
Baxter CA	CA	2	5	244	G	4			8	87	1.0	8	97
Britannia Pk	M	5	5	194	G	1		41%	10	117	1.0	10	130
Brown's Bay Pk	PPk	5	5	190	G	4			6	67	1.0	6	75
Carillon PPk	PPk	3	6	701	G	3			32	356	0.3	9	119
Cedar Shade Cg	C	4	5	122	G	3			1	12	1.0	1	14
Charleston L PPk	PPk	3	3	260	G	4			7	79	1.0	7	88
Charlottenburgh Pk	PPk	5	6	180	G	3		11%	7	81	1.0	7	91
Crysler Memorial Pk	PPk	5	4	330	G	3			15	167	1.0	15	187
Domaine Chartrand	C	4	3	244	G	4			1	15	1.0	1	17
Farran Pk	PPk	5	4	410	G	3			18	208	1.0	18	232
Fitzroy PPk	PPk	2	4	458	G	4			14	163	0.5	7	91
Glengarry Pk	PPk	4	5	180	G	3			8	91	1.0	8	102
Iroquois APk	M	3	3	127	G	3			5	55	1.0	5	62
Kitley Twp Pk	M	4	4	110	G	4			3	39	1.0	3	44
Lancaster Pk	C	6	4	150	G	3			1	15	1.0	1	17
Long Sault Pkwy/Mille	PPk	5	4	350	G	3			16	178	1.0	16	198
Long Sault Pkwy/Woodla	PPk	5	5	639	G	3			29	324	1.0	29	362
MacLaren's Landing	C	3	2	366	G	4			1	11	1.0	1	13
Mooney's Bay	M	4	5	275	G	1		22%	19	217	1.0	19	242
Morrisburg B & AP	M	5	2	110	G	2			3	36	1.0	3	40
Rideau R PPk	PPk	4	2	549	G	4			7	84	0.5	4	47
Sandy Bay Cottages	C	5	6	100	G	4			1	7	1.0	1	8
St. Lawrence B Resort	C	4	4	125	G	3			1	13	1.0	1	14
Torbolton Forest	P	6	2	442	G	5			3	39	1.0	3	43
Twp Pk - South Crosby	M	3	3	183	G	5			3	32	1.0	3	35
W.A. Taylor CA	CA	1	2	183	G	4			2	21	1.0	2	23
subtotal									223	2515		190	2389
unallocated =									43	486		37	462
16.2%													
total									267	3001		227	2851

OUT OF PROVINCE

NAME									ATT.	USE	_CC	C.ATT.	C.USE
unallocated										5828			5828

| TOTAL | | | | | | | | | | 45155 | | | 45155 |

APPENDIX 6
USERS MANUAL

A6.1   BEACH LIST

Introduction

This users manual provides information on how to interpret, update, and amend
the beach list, from the viewpoint of the computer user. The manual is
organized by data field (column) in the beach list.

The rationale behind the beach list is discussed in Section 3, and is not
repeated here. The user wishing to become familiar with how to use the beach
list should therefore review:
-    Section 3;
-    this users manual, for an explanation of the beach list file and how to
     use it;
-    Appendix 3, which includes a printed output of the list as supplied;
-    the disc file supplied to the Ministry of the Environment.

The beach list is available on disc as a worksheet file named 601APX3.WK1 and
created under the spreadsheet program Lotus 1-2-3, release 2. The file as
supplied to the Ministry currently occupies about 204 kilobytes of disc or
RAM storage.   The probable minimum hardware requirement for effective use of
this file is 640 kilobytes of RAM.

Our users manual presumes that the user is familiar with how to use Lotus
1-2-3, and does not repeat standard operating procedure for that software.

Because of the size of the file, only one file can be stored per 13 cm (5½
in)   disc.   We recommend that users interested in experimenting with
modifications to the list copy the original file onto another disc, rename
the copied file, and use the copied file for testing purposes. In this way,
the modifications, if saved, will not write over the original list.

As supplied, the file occupies worksheet range A1..X560. For printing, the
range A6..X560 should be used, with A5..X5 as a border row. Because of the
width of the worksheet, the left and right sections will have to be printed
as separate runs on most printers, using A5..A560 as a border column for the
right hand section (for example, see Appendix 3).

When printing, the user may wish to enter the title at the top of the
worksheet as a header which will repeat at the top of each page. In general,
headers should be used whenever printing to denote the date and version of
the run.

The worksheet is set to recalculate manually, and should be recalculated
after any data are changed and before any output is printed.

At present, the beach list records are sorted by Ministry of the Environment region, and alphabetically by site name within each region (see Appendix 3). The records can be resorted in any way desired.

NAME

We have reproduced ORSI site names as is except for correcting obvious errors, introducing standard abbreviations, and reordering within some names to improve the usefulness of the list (terms such as approved park, access, access point, public access, and public beach were moved from the beginning to the end of names).

The following abbreviations of common terms are used.

APk	approved park (under the Parks Assistance Act)
APt	access point
B	beach
CA	conservation area
Cg	campground
Con	concession
Cr	creek
IR	Indian reserve
L	lake
NPk	national park
Pk	park
PPk	provincial park
R	river
Twp	township.

XREF (crossreference)

For ORSI sites, the crossreference is a unique serial number that refers to the page and item number on the site printout provided to us. No crossreference is given for non-ORSI park sites.

GRID X and GRID Y (UTM grid references)

These coordinates provide a location to the nearest 1 km. The X and Y coordinates are respectively the first three digits of the east-west references and the first four digits of the north-south references shown on all 1:250,000 topographical maps. The X coordinates repeat every 6 degrees of longitude and therefore are not unique in Ontario, but the county etc. information provided elsewhere in the record is quite sufficient to pinpoint the region of the province where the site is located.

For ORSI sites, we have verified all coordinates, and have used them to

provide other geographical information in the records. Coordinates are reproduced as is, unless there are obvious errors. No coordinates are given for non-ORSI park sites.

D. ZONE (destination zone)

Destination zones are provided for all sites. These were developed by us for the beach use model and are not intended to serve any other purpose. The zones are as follows.

code	name	includes (regions/counties/districts)
0	Northwestern	Kenora, Rainy River, Thunder Bay
1	Northeastern	Algoma, Cochrane, Manitoulin, Nipissing north of Algonquin Provincial Park and Ballantyne Township, Sudbury R.M., Sudbury Terr. Dist., Timiskaming
2	Metro Toronto	Metropolitan Toronto
3	Golden Horseshoe	Durham, Halton, Hamilton-Wentworth, Niagara, Peel, York
4	Southwestern	Brant, Dufferin, Elgin, Essex, Haldimand-Norfolk, Huron, Kent, Lambton, Middlesex, Oxford, Perth, Waterloo, Wellington
5	Grey-Bruce	Bruce, Grey
6	Simcoe	Simcoe
7	Shield	Haliburton, Muskoka, Algonquin Provincial Park and balance of Ballantyne and Paxton townships in Nipissing, Parry Sound
8	Eastern	Frontenac, Hastings, Lennox and Addington, Nipissing southeast of Algonquin Provincial Park, Northumberland, Peterborough, Prince Edward, Renfrew, Victoria
9	St. Lawrence	Dundas, Glengarry, Grenville, Lanark, Leeds, Ottawa-Carleton, Prescott, Russell, Stormont.

There are no ORSI sites in destination zone 0. ORSI sites in zone 1 are fragmentary and therefore are excluded from the model. The model therefore encompasses individual sites in zones 2 through 9 only, which are entirely covered by ORSI. All non-ORSI park sites are in zones 0 and 1, except for four sites in Algonquin Park (zone 7).

COUNTY/REGION

Counties, regions, and districts are given for all sites, in accordance with

the list under destination zones above.

MUNICIPALITY

Local municipalities are given for all sites. These are based on the
geographical coordinates for ORSI sites, and relatively recent Ministry of
Transportation and Communications and other maps showing municipal
boundaries. The municipalities given are therefore subject to the occasional
error due to coordinate inaccuracies or very recent boundary changes.

Municipality names are given as shown in the Municipal Directory. Where
necessary, they have been abbreviated due to space considerations. For
municipalities which share their names with another local municipality (for
example, Sarnia City and Sarnia Township), the municipality name is followed
by its status, with the following abbreviations used.
   C   city
   T   town
   V   village
   Twp   township.

For sites on Indian reserves, the name of the reserve plus the designation IR
are given.

MoE REG. (Ministry of the Environment region)

Ministry regions are given for all sites. The following abbreviations are
used.
   SW   Southwestern
   WC   West Central
   C   Central
   SE   Southeastern
   NE   Northeastern
   NW   Northwestern.

WATER BODY

Water bodies are given for all sites. For ORSI sites, these are based on the
geographical coordinates, and are therefore subject to the occasional error
due to coordinate inaccuracies or other geographical ambiguities, although
other sources have been consulted to resolve ambiguities wherever possible.
These sources include the provincial parks and conservation areas directories
published by the Ministry of Natural Resources, and the commercial
accommodation and campground directories published by the Ministry of Tourism
and Recreation. For non-ORSI park sites, water bodies have been confirmed
with the Ministry of Natural Resources. For a few sites, we have followed

the water body name with a question mark, or stated "unknown" if the identity of the water body is totally unclear.

Water body names followed with no feature designations are lakes. Reservoirs and impoundments with recognized names of their own are considered lakes, except where they are widenings not significantly different in character from the impounded stream (for example, St. Lawrence River rather than Lake St. Francis). The following abbreviations are used for other types of features.

R   river
Cr   creek.

ADMIN. (administration type)

All sites are categorized by administrative agency. Administration is not always the same as ownership (witness for example the various waterfront recreation areas in Metropolitan Toronto owned by the Conservation Authority and administered by the Metropolitan government). The following abbreviations are used.

NPk   national park
PPk   provincial park
P   other provincial
CA   conservation authority
M   municipal
C   commercial
Pr   private
U   unknown.

There are always some ambiguities in such a classification. The guiding principle here has been to classify by agency insofar as it affects public use. Although in most cases the administrative agencies for ORSI sites are reproduced as given, we have made the following changes to the ORSI classifications to adhere to this principle. Other sources (provincial park, conservation area, commercial accommodation, and campground directories, and Ministry of Transportation and Communications and municipal maps) have been consulted where required, and obvious errors corrected.

.   The conservation authority classification does not exist in ORSI; authority sites are classified there as "regional". Other "regional" sites in ORSI include those administered by the Niagara Parks, St. Lawrence Parks, and St. Clair Parkway Commissions, which we have classed as provincial park, and those administered by upper tier municipalities, which we have classified as municipal.

.   There is also an "institutional" classification in ORSI. A few of the "institutional" sites are effectively open to general public use, for example, fairground properties, and urban parks operated by service clubs, and are classified in our list as municipal. All sites on Indian reserves are classified as "institutional" in ORSI; it appears that all such sites in our list are open to the general public, and we have

classified them as commercial because they are on private property so far
as the general public is concerned. The balance of "institutional" sites
in ORSI, which include not for profit youth camps, associations, etc.,
are classified as private on our list.

.   Commercial youth camps are classified as "commercial" in ORSI. We have
    classified these as private where we have been able to definitely
    identify them as youth camps, relying primarily on the current membership
    directory of the Ontario Camping Association.

.   A few sites administered by the Ontario Government are not open for
    general public use.   These ORSI and non-ORSI park sites, such as the
    Government staff development centre near Barrie and junior ranger camps
    in Algonquin Park, are classified in this list as private.

.   Private sites in this list therefore include those accessible only to
    members of clubs, institutions, property owners' associations,
    occupational groups, and other limited entry groups, and clients of youth
    camps, whether commercial or nonprofit.

NO. B. (number of beaches)

As noted in Section 3.2, each site record may include more than one
qualifying beach.   The number of qualifying beaches at each site is given
here.

At a few ORSI beaches, one or more of beach composition, dry beach width, and
length were unknown.   Where this was the case, we assumed that the beaches
failed to qualify under the relevant criteria.

For non-ORSI park beaches, composition is apparently sand or part sand in
almost all cases, so all sites have been included. Dry beach width and
length are unknown, but it is likely that most of these beaches would qualify
in any case.

WET and DRY (wet and dry beach widths)

Width codes are given for all beaches, as follows.
   0   unknown
   1   less than 5 m
   2   5 to 10 m
   3   10 to 20 m
   4   20 to 40 m
   5   40 to 80 m
   6   more than 80 m.

Beach widths at ORSI beaches are as given, with one exception. ORSI reports

a dry beach width for Wasaga Beach Provincial Park of less than 5 m. This would eliminate from the list Ontario's longest beach, and one of its most heavily used. The reported width is also contrary to fact under most (although perhaps not 1986) water level conditions. Accordingly we included the Wasaga beaches in the list, and substituted a dry beach width of 5 to 10 m. By definition, there is no code 0 (unknown) or 1 (less than 5 m) for dry beach width of ORSI beaches included in our list (Section 3.1, criterion 2). Wet beach width can be unknown for ORSI beaches otherwise qualifying, and is in a few cases.

Where there is more than one beach at an ORSI site, and widths are not uniform, we have calculated an average weighted to beach length.

We should caution that these widths were measured in the mid and late 1970s and early 1980s. The levels of the Great Lakes, which account for most of the total beach length in the province, have risen considerably since, and are likely to remain high through the next few years. The effect of higher lake levels in reducing dry beach widths has been significant in some locations. However, there is no simple formula or adjustment that can fairly reflect the impacts of lake level changes on the entered beach widths, as the effects on actual widths, and on the translation of those widths into the categories above, will vary from site to site.

Beach widths for non-ORSI park beaches are coded as 0 (unknown) rather than left blank, for computational reasons.

L. (beach length, in metres)

Beach lengths at ORSI beaches are as given. No lengths are provided for non-ORSI park beaches.

U.A. (presence or absence of uniform access to longer beaches)

This field is included solely for purposes of the beach use model. The rationale for this information is provided in Section 4.5.3.

All beaches are coded either 1, signifying absence of uniform access to longer beaches, or 0, in all other cases. A code 1 is assigned when:
- beach length divided by number of beaches is 400 m or more, and
- the site is known or assumed not to be one where there are frequent access points providing more or less uniform access to the length of the beach or beaches.

In the absence of more specific information, we assumed that the following sites do offer more or less uniform access:
- non-park provincial, conservation authority, and municipal sites in urban municipalities with populations of 2,000 or more, and inside or adjacent

to the urbanized areas of those municipalities;
- Wasaga Beach Provincial Park.

Accordingly, sites not meeting these criteria but with an average beach length of 400 m or more are coded 1. Toronto Islands was also coded 1; although the site is adjacent to the urbanized area of our largest municipality, the islands are accessible by water only and the resident population on the islands is very small.

EFF. L. (effective length, in metres)

This field is included solely for purposes of the beach use model. The rationale for this information is provided in Section 4.5.3.

Effective length is calculated as follows.
- If the uniform access code is 0, effective length is the same as beach length.
- If the uniform access code is 1, effective length is:
   $0.2(b-400n)+400n$, where
   - b = beach length
   - n = number of beaches.

TEMP. (water/air temperature regime)

Temperature regimes are given for all sites. These are taken from the "swimming classes" in Figure 3.1 (originally from Crowe, McKay, and Baker 1973/ref. 8.2). Codes are as follows.
   P   poor
   F   fair
   G   good
   E   excellent.

By definition, there are no sites coded U for unsatisfactory (Section 3.1, criterion 4). Because of the large scale of the map, there are necessarily some ambiguities in coding. Isolines near the shores of the Great Lakes were interpreted as dividing the Great Lakes from all adjacent inland waters. Inland lakes were assigned uniformly to one class, even if apparently divided. Sites apparently right on isolines were assigned to the higher class.

LOC. (location/access relative to population type)

Location/access codes are given for all sites. These are as follows; each site is assigned the lowest number code for which it is eligible.

1 - in an urban municipality with a population of 50,000 or more, and inside or adjacent to its urbanized area
2 - in an urban municipality with a population of 2,000 or more, and inside or adjacent to its urbanized area, or
  - adjacent to the urbanized area of an adjacent urban municipality with a population of 50,000 or more
3 - within 2 km of a paved provincial highway
4 - within 2 km of a paved road and within 20 km of a paved provincial highway
5 - within 10 km of a paved provincial highway, or
  - within 5 km of a provincial highway, or
  - within 5 km of a paved road
6 - road accessible.

Urban municipalities include cities, towns, and villages. Certain near urban township municipalities include significant urban or urban fringe concentrations and should also be defined as urban municipalities; we so defined Georgina, Kingston, and Sarnia townships. Urbanized areas include all built up areas normally identified as urban, save those which are almost exclusively recreational and are not year round communities. Distances are by road. All sites on islands requiring a ferry crossing were coded as 6, except for Toronto Islands which was coded as 4. Wasaga Beach Provincial Park was felt to be an anomaly; it would normally be coded as 2 by virtue of its location in a qualifying urban municipality, but it overwhelms the Town of Wasaga Beach in which it is located and functions as a tourist rather than an urban beach. Wasaga Beach Park is therefore coded as 3. Municipal populations are 1985 assessed populations. Road statuses and distances were taken from recent Ministry of Transportation and Communications and topographical maps.

AES. (aesthetics)

This field is unfilled at present. A simple field assessment system has been developed as part of this study and is included in Section 5.1. As the system is applied, the numerical scores produced can be incorporated into the list. For sites with more than one beach, the scores for individual beaches should be weighted in proportion to beach length to derive an aggregate site score. Use of this information in the model is discussed in Section 4.5.

MON. (monitoring agency)

It is intended that the agency monitoring beach water quality be recorded in this field. All provincial park sites (commission park sites excepted) have been recorded as MNR (Ministry of Natural Resources). In fact, the Ministry samples at most, but not all, of these sites; the balance are sampled by local health units, although the Ministry retains ultimate responsibility. The Ministry does retain records for all sites shown as MNR except for Port

Bruce Provincial Park. All other sites have been left blank, as no information has been collected from the health units.

%P. 86, %P. 85, %P. 84 (percentage of weeks posted in 1986, 1985, 1984)

Posting information was compiled from the weekly updates of postings prepared by Ministry of the Environment staff in 1984, 1985, and 1986. The figures for each year represent the percentage of the weeks covered by the updates in which postings were reported at each site, subject to the following comments.

. The updates covered the periods June 30 to August 31, 1984 (nine weeks), August 3 to 30, 1985 (four weeks), and July 5 to September 5, 1986 (nine weeks).

. The 1986 updates provided days posted in each week, while the earlier ones did not. We felt that in any case posting for one or more days in a week would be a sufficient indication of contamination incidence likely to affect use. Accordingly, we did not seek to obtain a finer degree of accuracy for 1986 by using the days posted information.

. The matching of sites named in the updates to sites in the beach list was sometimes problematic. Many of the names in the updates do not match names in ORSI, or are not located precisely enough regionally to make searching for a match worthwhile. The updates also include some northern sites outside the ORSI coverage area. We crosschecked names in the updates with other sources (Ministry of Transportation and Communications, topographical, and municipal maps; conservation area and campground directories) where possible, and were able to identify about 80% of the update sites within the ORSI coverage area. Of those we were able to identify, about 30% are not inventoried in ORSI, probably in most cases because they do not meet any normal criteria of significance or value as swimming beaches. There are also a few update sites which did not exist when the ORSI field work was undertaken (for example, Humber Bay Park, Etobicoke); we have not included these sites in the beach list because we do not have sufficient information on them. As well, many of the identifiable ORSI sites in the updates are excluded from our list because they fail one or more criteria. As a result, we can identify a match with sites on the beach list for only about 25% of the update sites. There are still overlap problems for the matched sites. For example, Toronto Islands is a single site on our list, but includes several different locations in the updates, not all of which are necessarily posted or not posted at the same time. Where there are problems of this nature, we have made some crude assumptions about the proportions of our sites represented by each site given in the updates, and these were incorporated into our percentages.

. These fields were left blank for the large majority of sites, where no postings were reported or could be identified.

Values are rounded to the nearest 1%.

%P. X (mean of %P. 86, %P. 85, %P. 84)

For any site where a posting value is given for one or more of 1984, 1985, and 1986, a three year average is provided, rounded to the nearest 1%.

A6.2   BEACH USE MODEL

<u>Introduction</u>

This users manual provides information on how to interpret, test, update, and
amend the beach use model, from the viewpoint of the computer user. The
manual includes:
-   explanations of the contents and workings of the five sections of the
    model;
-   explanation of how to add beaches to the model;
-   examples of how to test the model.

The theory and rationale behind the model are discussed in Section 4, and are
not repeated here.   The user wishing to become familiar with how to use the
model should therefore review:
-   Sections 4.1 through 4.6, for an explanation of the concepts and
    rationale underlying the model;
-   this users manual, for an explanation of the model file and how to use
    it;
-   Appendix 5, which includes a printed output of the model as supplied;
-   the disc file supplied to the Ministry of the Environment.

The beach use model is available on disc as a worksheet file named
601APX5.WK1 and created under the spreadsheet program Lotus 1-2-3, release
2.   The file as supplied to the Ministry currently occupies about 293
kilobytes of disc or RAM storage. The probable minimum hardware requirement
for effective use of this file is 640 kilobytes of RAM.

Our users manual presumes that the user is familiar with how to use Lotus
1-2-3, and does not repeat standard operating procedure for that software.

Because of the size of the file, only one file can be stored per 13 cm (5¼
in) disc.   We recommend that users interested in testing the model or
experimenting with altering values copy the original file onto another disc,
rename the copied file, and use the copied file for testing purposes. In
this way, the modifications, if saved, will not write over the original
model.

As supplied, the file occupies worksheet range A1..BE644. For printing, the
following ranges should be used:
-   A5.1 Population and Participation   S30..Z116 (border row S28..Z29)
          by Origin Zone
-   A5.2 Occasions by Origin Zone   S6..AA19
-   A5.3 Time-Distance Matrix   AC5..AM19
-   A5.4 Origin-Destination Matrixes   AB24..AP64 (uncalibrated)
                                           AR24..BE64 (calibrated)
-   A5.5 Beach Use by Destination Zone   E10..Q574 (border row E8..Q9,
              and Site   border column A10..A574)

For the multipage sections A5.1 and A5.5, the preceding print ranges exclude titles. The user may wish to enter the titles of these sections as headers which will repeat at the top of each page. In general, headers should be used whenever printing to denote the date and version of the run.

The range A600..G644 is occupied by lookup and index tables which are essential to the model but would not normally be printed. The purpose of these tables is outlined in the Beach Use by Destination Zone and Site section of this manual.

The worksheet is set to recalculate manually, and should be recalculated after any data are changed and before any output is printed.

Beach Use by Destination Zone and Site (Section A5.5)

This section of the model contains all the individual beach sites and their estimated swimming use. Since it will be the most frequently used section, it is located in the upper left hand or "home" portion of the worksheet.

This section may be viewed by starting at worksheet cell Al (the "home" cell). Sections 4.2, 4.5, and 4.6 of the report explain the concepts behind, and the data sources for, this portion of the model.

The section consists of rows, one for each of the 507 beach list sites incorporated in the model, grouped by destination zone. At present, the individual beach site records are sorted alphabetically by site name within each destination zone group. The records can be resorted in any way desired within destination zones, such as by county/region, without affecting the model. However, records cannot be resorted across destination zones in any way, or the model will cease to function.

The columns from COUNTY/REGION through %P.X include data for each site which are taken directly from, and correspond completely with, the beach list data base (as does the name for each site). Section 4.2 describes the procedure used to incorporate these data in the model. The specific columns are as follows:
- COUNTY/REGION
- REG. (Ministry of the Environment region)
- ADM. (administration type code)
- WET (wet beach width code)
- DRY (dry beach width code)
- E.L. (effective beach length, in metres)
- TEM. (water/air temperature regime code)
- LOC. (location/access relative to population code)
- AES. (aesthetics code)
- %P.X (mean percentage of weeks posted).

The specifications for the individual data fields are dealt with in the sections of this report that deal with the beach list, in particular Section A6.1 of this appendix.

As will be discussed below, COUNTY/REGION and REG. are not used in calculating site use and attraction, and are provided for information only. Accordingly, they are not shown in the Section A5.5 printout in Appendix 5. The computer user may wish to hide these columns, to enable more of the most critical information to fit on the screen display.

Although the model is designed to incorporate data on aesthetics, the AES. column is blank at present, as no data are available.

The column ATT. shows an uncalibrated attraction index for each site. This is calculated on the basis of the information in the columns ADM. through %P.X. In some cases, codes are assigned weights for calculation purposes, as discussed in Section 4.5. These weights are entered in what Lotus 1-2-3 calls index tables (for beach widths) or lookup tables (for administrative type, temperature regime, location/access code, and aesthetic score when available). These tables are found in the range A600..G644 of the model. The Lotus formula for the attraction index refers to the appropriate table and finds the weight corresponding to the value entered in the site record.

The attraction index is calculated as follows:
- the appropriate weight for the ADM. code, taken from the ADMIN lookup table, times
- the appropriate weight for the combination of WET and DRY codes, taken from the BMAT index table, times
- E.L., times
- the appropriate weight for the TEM. code, taken from the CLIM lookup table, times
- the appropriate weight for the LOC. code, taken from the LOC lookup table, times
- when data are available, the appropriate weight for the AES. code, taken from the AES lookup table, but in the meantime 1, times
- (1-%P.X), divided by
- 100, to provide smaller, more manageable index values.

At the end of each Southern Ontario destination zone, there is a row showing an unallocated percentage. This percentage is intended to represent the amount of beach swimming taking place at sites in that zone that are not included in the beach list or model.

Total uncalibrated attraction indexes for each Southern Ontario destination zone are shown at the bottom of the ATT. column for each zone, and are calculated as follows:
- the sum of ATT. for individual sites in the zone, divided by
- 1 minus the unallocated percentage for that zone.

The total ATT. for Northeastern and Northwestern Ontario are assumed values, in proportion to the uncalibrated volumes of beach swimming use by Ontario residents in Ontario which the model estimates as originating in those zones.

The total ATT. for the various zones are reproduced in the Aj column of Time-Distance Matrix (Section A5.3).

The column USE includes estimated uncalibrated beach swimming use, in thousands of occasions, for each site. Total uncalibrated use for each destination zone is taken from the HB+NHB Total column in Origin-Destination Matrixes (Uncalibrated) (Section A5.4). Use for each site in a zone equals the zone's total USE, divided by the zone's total ATT., times ATT. for the site.

The column CC includes calibration constants for each site. As discussed in Section 4.6, these are 1 unless there is reason to insert another value on the basis of known discrepancies between USE and known use for individual sites.

The column C.ATT. includes calibrated attraction indexes for each site. These are the products of ATT. times CC. Northern and total C.ATT. are calculated in the same way as ATT. The total C.ATT. for the various zones are reproduced in the C.Aj column of Time-Distance Matrix (Section A5.3).

The column C.USE includes estimated calibrated beach swimming use, in thousands of occasions, for each site. Total calibrated use for each destination zone is taken from the HB+NHB C.Tot. column in Origin-Destination Matrixes (Calibrated) (Section A5.4). Use for each site in a zone equals the zone's total C.USE, divided by the zone's total C.ATT., times C.ATT. for the site. The C.USE values are the final output of the model.

Testing the Model

The user can gain an idea of the interactive nature of the model, and how the model responds to any change, by some simple tests. Before conducting any test or experimenting with altering values, the user should make a copy of the original worksheet file, rename the copied file, and use the copied file for testing purposes.

To take the user through a simple example of testing the model and its responsiveness, we will refer to the Toronto Islands site, shown on the first page of the Section A5.5 printout in Appendix 5.

For Toronto Islands, column %P.X shows a value of 40%; in other words, the Islands beaches were posted for an estimated 40% of the time during recent swimming seasons. This value reduces ATT. (and C.ATT.) for the site by 40%, and therefore also substantially reduces USE and C.USE.

If the user replaces the 40% value in the %P.X cell for Toronto Islands with 0 (or erases it), and recalculates the model, the results will be as shown in the printout of the first page of Section A5.5 titled "Clean Beach", at the end of this appendix. The effects of this change can be compared with the Appendix 5 printout. C.USE at Toronto Islands increases from 214,000 to 351,000 occasions per year, and total C.USE for Metro Toronto increases from 736,000 to 879,000 occasions per year. C.USE at all other sites in the province changes too, mostly by small amounts that are not reflected in the rounded data (but see for example Confederation Park in Hamilton farther down the page, where use declines from 381,000 to 378,000).

The user may also wish to experiment with the values used to weight administrative type, beach width, temperature regime, location/access, and (in future) aesthetic categories, in calculating the attraction indexes for individual sites. This can be done by changing the values in the lookup and index tables located in the A600..G644 range.

Finally, the user may wish to experiment with the calibration constants (CC) in Section A5.5. The purpose and use of these constants is discussed in Section 4.6 of the report.

Adding Beaches to the Model

New entries can be easily added to Section A5.5 of the model by inserting new rows for them. Data must be added to fill columns COUNTY/REGION through %P.X. Any data changes or additions should completely correspond with changes or additions to the beach list, and should conform with the established specifications for beach data base information (see Section A6.1 of this appendix).

In addition to the data for a new entry, formulas must also be entered for calculating attraction and use. This can be done by copying the ATT., USE, C.ATT., and C.USE formulas from the row above or below the new entry. A CC of 1 (or some other value, if justified) also needs to be provided. If the new entry happens to be at the top or bottom of the set of entries for its destination zone, the user should check the sum formulas at the bottom of the destination zone group to ensure that the new entry is included in the formulas.

Entering a row in the upper part of the worksheet may create a space within one or more of Sections A5.1 to A5.4. The only impact of this will be cosmetic; if the user wishes to correct for this, he or she will have to take great care in moving portions of the affected sections to eliminate the gap, and in checking all formulas afterwards to ensure that they are still correct.

Entries can be deleted from Section A5.5 by deleting rows, provided that those rows are not in the upper part of the worksheet. If the user wishes to delete an entry in a row which also includes a portion of Sections A5.1 to A5.4, he or she should erase the entry material. The gap in Section A5.5 can be left as is, or corrected for with great care as suggested in the preceding paragraph.

The effects of adding a new entry can be demonstrated through an example of a hypothetical Bradley Park in Metro Toronto. At the end of this appendix, we have provided a printout of the first page of Section A5.5 titled "New Beach", with a new row and hypothetical data for Bradley Park highlighted. The model has been recalculated to show the effects on other sites of the addition of Bradley Park, which can be compared with the original printout in Appendix 5.

Population and Participation by Origin Zone (Section A5.1)

This section of the model may be viewed starting at worksheet cell S25. Sections 4.3.1 and 4.3.2 of the report explain the concepts behind, and the data sources for, this portion of the model.

The section includes rows for each county, region, and district in Ontario, grouped and totalled by origin zone. The population of each county/region is broken down into six age groups. All population data are entered in thousands. While the data supplied are from the 1981 Census, they can be replaced with newer data as these become available, such as from the 1986 Census.

The row OCC/PER at the top of the model section shows swimming occasions per Ontario resident per year for each age group.

The entry RPF shown at the end of each origin zone is the regional participation factor (ratio of each zone's swimming occasions per person per year to the provincial average).

The row Occ/Per just above the RPF row at the end of each origin zone shows occasions per zone resident per year for each age group, calculated as the OCC/PER for the age group times the RPF for the zone.

Occasions by Origin Zone (Section A5.2)

This section of the model may be viewed starting at worksheet cell S6. Sections 4.3.2 and 4.3.3 of the report explain the concepts behind, and the data sources for, this portion of the model.

The column TOT OCCS represents the total swimming occasions generated each year by residents of each origin zone. These are calculated by:
-   multiplying the Occ/Per for each age group in each zone by the population of each age group in each zone (from Section A5.1), to yield numbers of swimming occasions per year expected from each age group in each zone;
-   summing the occasions expected from each age group to yield total annual occasions generated by residents of each zone.

The column % HB provides the estimated percentages of swimming occasions originating from each origin zone which are homebased. (The percentages of occasions which are nonhomebased are 1 minus the homebased percentages.)

The columns OCCS HB and OCCS NHB respectively show the estimated homebased and nonhomebased swimming occasions originating from each zone. These are calculated by multiplying TOT OCCS by % HB and (1-% HB) respectively.

The columns %HB BCH and %NHB BCH show the respective percentages of homebased and nonhomebased swimming occasions originating from each zone that are estimated to take place at beaches.

The columns O HB BCH and O NHB BCH respectively show the estimated homebased

and nonhomebased swimming occasions originating from each zone. These are calculated by multiplying OCCS HB by %HB BCH, and OCCS NHB by %NHB BCH, respectively.

All occasion data are in thousands.

Gravity Model Formula

The basic principles underlying the allocation of beach swimming occasions from origin zones to destination zones by means of a gravity model are discussed in Section 4.4. The details of the allocation formula are presented here, as they underlie the explanations of Sections A5.3 and A5.4 of the model which follow.

The normal mathematical form of a gravity model is:

$$T_{ij} = \frac{K_{ij} \times P_i \times A_j \times F(D_{ij})}{A_j \times F(D_{ij})}$$

where:
- T_{ij} is the flow from origin i to destination j
- K_{ij} is a calibration factor
- P_i is the total input available from origin i to all destinations
- A_j is the attraction of destination j
- $F(D_{ij})$ is a function of the distance D_{ij} from origin i to destination j, expressed so as to cause destination attraction to decrease with destination distance from the origin.

In the beach use model, calibration is dealt with on an individual site basis, as discussed in Section 4.6. As a result, the actual formula used for origin-destination allocation of nonhomebased beach swimming occasions is:

$$T_{ij} = \frac{P_i \times A_j \times e^{(cD_{ij})}}{\Sigma A_j F(D_{ij})}$$

where:
- T_{ij} is the flow of nonhomebased beach swimming occasions from origin zone i to destination zone j;
- P_i is the total of nonhomebased beach swimming occasions in Ontario participated in by residents of origin zone i, taken from Occasions by Origin Zone (Section A5.2);
- A_j is the summed attraction index for destination zone j, taken from Time-Distance Matrix (Section A5.3) and in turn from Beach Use by Destination Zone and Site (Section A5.5);
- $e^{(cD_{ij})}$ is the distance function, the number e (2.71828...) raised to the power of distance times a coefficient c; the coefficient c is -0.1; distance is the time-distance from origin zone i to destination zone j taken from Time-Distance Matrix (Section A5.3);
- $\Sigma A_j F(D_{ij})$ is the sum of the products of the A_j for each destination zone times the distance function $e^{(cD_{ij})}$ from origin

zone i to the corresponding destination zone; the $\Sigma A_j F(D_{ij})$ for each origin zone is shown in the Nonhomebased Occasions tables in Origin-Destination Matrixes (Section A5.4).

For origin-destination allocation of homebased swimming occasions, the formula is the same except as follows:
- in P_i, homebased occasions are substituted for nonhomebased occasions;
- the coefficient of the exponent in the distance function is -1.4.

Time-Distance Matrix (Section A5.3)

This section of the model may be viewed starting at worksheet cell AC5. Section 4.4 of the report explains the concepts behind, and the data sources for, this portion of the model.

The section includes rows for each destination zone, and columns for each origin zone. The value shown at each row-column intersection represents estimated hours of driving time between the population centroid of the origin zone, and the beach supply centroid of the destination zone.

The columns Aj and C.Aj include summed attraction indexes for each destination zone, uncalibrated and calibrated respectively. These are taken from Beach Use by Destination Zone and Site, Section A5.5, and are explained in our discussion of that section.

Origin-Destination Matrixes (Section A5.4)

This section of the model may be viewed starting at worksheet cells AB24 (uncalibrated) and AR24 (calibrated). Section 4.4 of the report explains the concepts behind, and the data sources for, this portion of the model.

The section is duplicated, once in an uncalibrated version and once in a calibrated version. As outlined in Section 4.6.2, the only difference between the two is that the uncalibrated version uses uncalibrated summed attraction indexes for each destination zone, while the calibrated version uses calibrated summed attraction indexes.

Each version includes two tables, one for nonhomebased occasions and one for homebased and total occasions. Each table includes rows for each destination zone, and columns for each origin zone. The value shown at each row-column intersection represents estimated annual beach swimming occasions flowing from the origin zone to the destination zone.

For destinations outside Ontario, the flows of beach swimming occasions are not calculated on a gravity basis.
- The row Ex Ont% shows estimated percentages of occasions originating in each origin zone which are destined outside Ontario.
- The row Ex Ont shows estimated occasions originating in each origin zone which are destined outside Ontario. These are calculated by multiplying Ex Ont% times O NHB BCH or O HB BCH (nonhomebased and homebased beach

swimming occasions for the origin zone) from Section A5.2, as appropriate.

For Ontario destinations, the flows of occasions are calculated using the formula given in the Gravity Model Formula section.

The row EAjFDij provides values for each origin zone, which are the sum of the products of the Aj or C.Aj for each destination zone (from Section A5.3), times the number e raised to the power of a coefficient times the distance from the origin zone to the corresponding destination zone. The Aj and C.Aj are taken from Section A5.3. The coefficients (-0.1 for nonhomebased use and -1.4 for homebased use) are shown separately to the left of the uncalibrated tables (COEFF.), thus permitting them to be varied by future analysts. The distances between origin and destination zones are taken from Section A5.3.

The value at each row-column intersection is calculated as follows:
- O NHB BCH or O HB BCH for the origin zone, taken from Section A5.2, minus Ex Ont for that origin zone, times
- Aj or C.Aj for the destination zone, taken from Section A5.3, times
- the number e raised to the power of the appropriate coefficient times the distance from the origin zone to the destination zone shown in Section A5.3, divided by
- EAjFDij for the origin zone.

Total occasions from each origin zone are summed at the bottom of each table. These do not correspond exactly with the values in the O NHB BCH and O HB BCH columns in Section A5.2, due to rounding.

Under the heading D.ZONE in each table, total occasions flowing to each destination zone are summed in the columns Total or C.Tot. The columns % or C.% show the percentages of total use flowing to each destination zone, including outside Ontario. The columns %inOnt and C%inOn show the percentages of Ontario-destined use flowing to each Ontario destination zone.

Homebased and nonhomebased occasions are added together in the last two columns of the homebased and total occasions tables, under the heading HB+NHB. The columns Total or C.Tot. show total occasions of both types flowing to each destination zone. The columns %inOnt and C%inOn show the percentages of Ontario-destined use of both types flowing to each Ontario destination zone.

All occasion data are in thousands.

A5.5 Beach Use by Destination Zone and Site

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT.	C.USE
NORTHWESTERN ONTARIO													
unallocated									205	1299		201	1298
NORTHEASTERN ONTARIO													
unallocated									587	4432		574	4429
METRO TORONTO													
Ashbridge's Bay Pk	M	3	4	348	P	1		39%	13	115	1.0	13	115
Marie Curtis Pk	M	3	4	518	P	1		79%	7	58	1.0	7	58
Sir Casimir Gzowski Pk	M	2	4	872	P	1		81%	10	87	1.0	10	87
Toronto Islands	M	4	4	1849	P	4			40	349	1.0	40	351
Woodbine B	M	3	6	532	P	1		39%	20	175	1.0	20	176
subtotal									89	783		89	788
unallocated =									10	91		10	91
10.4%													
total									100	874		100	879
GOLDEN HORSESHOE													
Albert E Crookes Memor	M	3	2	105	P	1			3	25	1.0	3	25
Albion Hills CA	CA	6	5	180	E	3			10	87	1.0	10	88
Bay Beach Corporation	Pr	4	5	152	G	4			0	0	1.0	0	0
Binbrook Dam & CA	CA	2	2	107	E	4			2	16	1.0	2	16
Bruce's Mill CA	CA	5	2	174	E	4		26%	2	19	1.0	2	19
Buffalo Canoe Club	Pr	6	4	137	G	4			0	0	1.0	0	0
Cedar B Pk	C	3	3	152	E	4		7%	1	8	1.0	1	8
Chippawa Cr CA	CA	2	3	135	E	4			4	39	1.0	4	39
Christie CA	CA	3	5	366	E	3			20	177	1.0	20	178
Claireville CA	CA	3	5	150	E	1		33%	11	97	1.0	11	97
Club La Salle	Pr	5	3	380	G	1			0	0	1.0	0	0
Confederation Pk APk	M	3	6	964	P	1		30%	41	375	1.0	41	378
Copetown Holiday Pk Lt	C	4	4	147	E	3			2	14	1.0	2	14
Courtcliffe Pk	C	1	2	122	E	3		33%	0	3	1.0	0	3
Crystal B Pk	C	5	3	229	G	4			1	11	1.0	1	11
Darlington PPk	PPk	2	2	152	P	2			3	27	4.0	12	111
Duffin Cr Waterfront A	CA	4	2	400	P	2			8	72	1.0	8	73
Fralicks B Lot	M	4	2	100	E	4			2	15	1.0	2	15
Glendale B	C	2	4	305	E	4			2	21	1.0	2	21
Gulliver's L & Pk	C	1	4	478	E	4			1	10	1.0	1	10
Hamilton B	M	4	2	4185	P	1			111	1009	1.0	111	1014
Humberstone Centennial	M	5	5	300	G	3		7%	13	114	1.0	13	114
Innes L Pk	C	2	6	240	E	4			2	16	1.0	2	16
Iroquois B	M	3	3	390	P	2			15	140	1.0	15	141
Jack Darling Memorial	M	4	3	165	P	1		11%	8	70	1.0	8	71
Jones B	C	4	5	228	G	1		7%	4	35	1.0	4	35
Kelso CA	CA	4	5	270	E	4			10	91	1.0	10	93
Knight's Dunmark Pk	C	4	3	117	E	3			1	10	1.0	1	10
Lakeside Pk	M	4	5	162	P	1			10	90	1.0	10	91
Lakeside Pk APk	M	5	5	366	G	1		100%	0	0	1.0	0	0
Lakeview Pk	M	4	4	395	P	1			24	221	1.0	24	221

Handwritten annotations:

40% posting eliminated

estimated use rises from 214 to 351

attraction index rises from 24 to 40

total estimated use for Metro rises from 736 to 879

estimated use here falls from 381 to 378

NEW BEACH

A5.5 Beach Use by Destination Zone and Site

(handwritten: New Entry, with arrow pointing to Bradley Pk row)

NAME	ADM.	WET	DRY	E.L.	TEM.	LOC.	AES.	%P.X	ATT.	USE	CC	C.ATT	C.USE
NORTHWESTERN ONTARIO													
unallocated									206	1299		201	1298
NORTHEASTERN ONTARIO													
unallocated									588	4432		575	4429
METRO TORONTO													
Ashbridge's Bay Pk	M	3	4	348	P	1		39%	13	114	1.0	13	115
Bradley Pk	M	3	3	500	P	1		20%	21	183	1.0	21	185
Marie Curtis Pk	M	3	4	518	P	1		79%	7	58	1.0	7	58
Sir Casimir Gzowski Pk	M	2	4	872	P	1		81%	10	86	1.0	10	87
Toronto Islands	M	4	4	1849	P	4		40%	24	208	1.0	24	209
Woodbine B	M	3	6	532	P	1		39%	20	174	1.0	20	175
subtotal									95	824		95	829
unallocated = 10.4%									11	96		11	96
total									106	919		106	925
GOLDEN HORSESHOE													
Albert E Crookes Memor	M	3	2	105	P	1			3	25	1.0	3	25
Albion Hills CA	CA	6	5	180	E	3			10	87	1.0	10	87
Bay Beach Corporation	Pr	4	5	152	G	4			0	0	1.0	0	0
Binbrook Dam & CA	CA	2	2	107	E	4			2	16	1.0	2	16
Bruce's Mill CA	CA	5	2	174	E	4		26%	2	19	1.0	2	19
Buffalo Canoe Club	Pr	6	4	137	G	4			0	0	1.0	0	0
Cedar B Pk	C	3	3	152	E	4		7%	1	8	1.0	1	8
Chippawa Cr CA	CA	2	3	135	E	4			4	39	1.0	4	39
Christie CA	CA	3	5	366	E	3			20	177	1.0	20	178
Claireville CA	CA	3	5	150	E	1		33%	11	96	1.0	11	97
Club La Salle	Pr	5	3	380	G	1			0	0	1.0	0	0
Confederation Pk APk	M	3	6	964	P	1		30%	41	374	1.0	41	376
Copetown Holiday Pk Lt	C	4	4	147	E	3			2	14	1.0	2	14
Courtcliffe Pk	C	1	2	122	E	3		33%	0	3	1.0	0	3
Crystal B Pk	C	5	3	229	G	4			1	11	1.0	1	11
Darlington PPk	PPk	2	2	152	P	2			3	27	4.0	12	110
Duffin Cr Waterfront A	CA	4	2	400	P	2			8	72	1.0	8	72
Fralicks B Lot	M	4	2	100	E	4			2	15	1.0	2	15
Glendale B	C	2	4	305	E	4			2	21	1.0	2	21
Gulliver's L & Pk	C	1	4	478	E	4			1	10	1.0	1	10
Hamilton B	M	4	2	4185	P	1			111	1005	1.0	111	1011
Humberstone Centennial	M	5	5	300	G	3		7%	13	113	1.0	13	114
Innes L Pk	C	2	6	240	E	4			2	16	1.0	2	16
Iroquois B	M	3	3	390	P	2			15	139	1.0	15	140
Jack Darling Memorial	M	4	3	165	P	1		11%	8	70	1.0	8	70
Jones B	C	4	5	228	G	1		7%	4	34	1.0	4	35
Kelso CA	CA	4	5	270	E	4			10	91	1.0	10	92
Knight's Dunmark Pk	C	4	3	117	E	3			1	10	1.0	1	10
Lakeside Pk	M	4	5	162	P	1			10	90	1.0	10	91
Lakeside Pk APk	M	5	5	366	G	1		100%	0	0	1.0	0	0

(handwritten annotations:)
- estimated use falls from 214 to 209
- total attraction index for Metro rises from 82 to 106
- total estimated use for Metro rises from 736 to 925
- estimated use here falls from 381 to 376